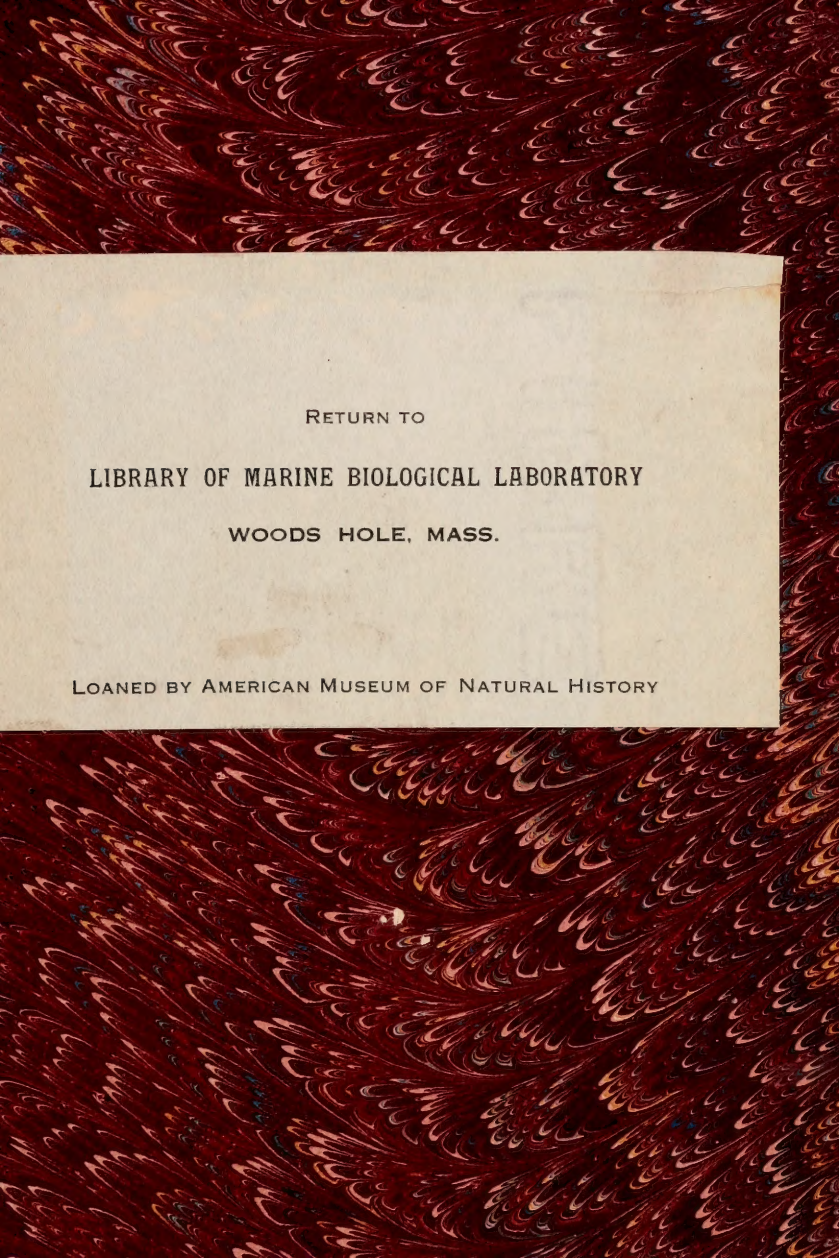






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THE CANADIAN
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No. 1.

HEMIPTERA FROM MUSKOKA LAKE DISTRICT.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

This list is presented as a slight contribution to our knowledge of the geographical distribution of the North American Hemiptera. As our literature of this order is by no means overburdened with faunal lists, I trust that the present will find sufficient excuse for its appearance in the matter it contains. I have made every effort to have the list as accurate and complete as possible, under the circumstances. The material was accumulated during a brief collecting tour in the Muskoka Lake District of Canada, in the interval from July 25th to August 3rd, 1888. The particular localities being in the vicinity of Bracebridge, along the Muskoka River to the Lake, and some of the adjoining islands, and along the road from Bracebridge to South Falls.

For the information of such as are not conversant with the physical features of this beautiful Lake District, I will add that it lies in the metamorphic belt reaching eastward from the Georgian Bay. The surface is somewhat rugged, with bold, rocky bluffs from one hundred to two hundred feet in height, skirting the river and lowlands; the latter presenting a good depth of soil, which is elsewhere very thin, in many places quite insufficient to cover the rocks. Coniferae, poplars, birches, and a few oaks form the bulk of the timber on the rocky highlands, with the addition of maple, hickory, beech, basswood, etc., on the deeper soils. The undergrowth is largely hazelnut, with blueberry, raspberry, viburnum, spiraea, and other bushes interspersed. Away from the cultivated areas very little grass is to be found; but carex, cypreus and glyceria take its place to a large extent. The bane of this land is the ever-recurring "bush-fire," and to an entomologist a "burned district" is a wilderness indeed.

The Hemiptera taken were largely such as might have been expected from this locality, but were more numerous in individuals than I had

anticipated; the Homoptera especially, seemed proportionately more numerous than farther south, and included many rarities.

I am indebted for a number of the species here enumerated, to the kindness of Mr. A. H. Kilman, who was one of our party, and who passed over to me any luckless Hemipter that perchance found lodgment in his indefatigable umbrella. To Mr. P. R. Uhler, I am under renewed obligations for the determination of some of the more difficult forms, especially in the Capsidæ.

HETEROPTERA.

Scutelleridæ.

Homæmus ænifrons Say. Occasional on sedges and weeds on the lowlands.
Eurygaster alternatus Say. Abundant with the last.

Corimelænidæ.

Corimelæna atra Am. and Serv. One nymph taken.
Corimelæna pulicaria Germ. A single example.

Pentatomidæ.

Podisus spinosus Dall. Taken here as elsewhere on trees and bushes, but more rarely than the next.
Podisus modestus Dall.
Neottiglossa undata Say. Common.
Cosmopepla carnifex Fab.
Mormidea lugens Fab. One example.
Euchistus fissilis Uhl.
Euchistus tristigmus Say. Occasional.
Banasa calva Say. Abundant on the arbor-vitæ.

Coreidæ.

Alydus curinus Say. Frequent on flowers of the Canada thistle in old fields.
Protenor Belfragei Hagl. = *Tetrarhinus Quebecensis* Prov. One nymph swept from weeds.

Berytidæ.

Neides muticus Say. Common.
Corizus punctiventris Dall. Larger and darker coloured than examples from Buffalo.
Corizus nigristernum Sign. Less abundant than the preceeding. At Buffalo it is the common form.

Lygæide.

Nysius grænlandicus Zett. Scarce.

Cymus luridus Stål. Three examples, swept from a low swampy spot by the roadside, near South Falls.

Cymus angustatus Stål. Not common.

Cymus clavicularis Hahn. Abundant everywhere on the lowlands.

Blissus leucopterus, Say. One brachypterus example, swept from the borders of an oat field on Muskoka river, near the lake.

Geocoris borealis Dall. Taken with the preceeding. This appears to be but a dark variety of *G. bullatus* Say.

Ligyrocoris sylvestris Linn. Very abundant in the cultivated districts.

Peliopelta abbreviata Uhl. One small, short-winged example captured.

Capsidæ.

Brachytropis calcarata Fall.

Trigonotylus ruficornis Fall.

Miris affinis Reut.

Collaria Meilleurii Prov. These four species were not uncommon where cultivation had prepared the way for them. The latter was just coming to perfection.

Hadromena pulverulenta Uhl. (MS.) Two examples.

Diommatius congrex. Uhl. Rare.

Phytocoris eximus. Reut. Occasional.

Phytocoris pallidicornis Reut. Abundant, and of large size.

Phytocoris colon. Say. One example.

Neurocolpus nubilus Say. Common, and as a rule, deeply coloured.

Calocoris rapidus Say. A single specimen.

Melinna modesta Uhl. Beaten from pine trees.

Lygus pabulinus Linn.

Lygus pratensis Linn.

Lygus flavonotatus Prov. A few taken.

Lygus invitus Say. Common.

Lygus intersectus Uhl. (MS.) Abundant.

Coccobaphes sanguinarius Uhl. Not uncommon on maple and beech trees, especially near South Falls.

Pæciloscytus unifasciatus Fab. Numbers taken on the cultivated uplands south of Bracebridge, and elsewhere.

Pæcilocapsus lineatus Fab. Rare.

Largidea opaca Uhl. (MS.) Smaller and slighter than New York examples.

Camptobrochis grandis Uhl. Common Apparently of nocturnal habits, as I took several flying around the candle at our camp ; some of these individuals were extremely dark, even approaching an almost uniform piceous black ; others were as pale as those taken near Buffalo.

Neoborus Petitii Uhl. (MS.) Several pale examples.

Fulvius anthocoroides Uhl. One example.

Monalocoris flicis Linn. Common everywhere on ferns.

Hyaliodes vitripennis Say. This neat little species was taken frequently on pines, and occasionally on other trees and bushes.

Pilophorus amœmus Uhl. Common on pine trees.

Globiceps flavomaculatus Fab. One example taken. This species was erroneously cited as occurring at Buffalo, in my list of Capsidæ from that locality (CAN. ENT., xix., p. 72, 1887). The insect there referred to was the next, which superficially resembles the *flavomaculatus*.

Mimocaps gracilis Uhl. (MS.) A few swept from grass and weeds near a rivulet among the hills.

Micomma gilvipes Uhl. (MS.) Three examples taken with the preceding.

Macrolophus seperatus Uhl. Three examples.

Stiphrosoma stygica Say. Scattering.

Labops hesperia Uhl. A few brachypterous examples swept from an oat field on the flats near the mouth of the river.

Idolocoris agilis Uhl. Common on the lowlands.

Orthotylus alternatus Uhl. Common on bushes, especially the hazelnut.

Macrotylus guttatus Uhl. (MS.) One example of this elegant little Capsid was swept from briars growing on a rocky hillside near the river.

Rhinocapsus Vanduzeei Uhl. (MS.) Not uncommon among rank weeds in damp situations.

Psallus variabilis Fall. A single example.

Psallus antennatus Uhl. (MS.) Several taken.

Plagiognathus obscurus Uhl.

Agalliastes associatus Uhl. One example of the typical form occurred to me while sweeping near South Falls.

Anthocoridae.

Dolichomerus elongatus Reut.

Dilasia fuscata Reut. Two examples taken from a log of hard maple ; they occurred under loose bark where there was a slight fungoid growth.

Triphleps insidiosus Say. Common.

Anthocoris musculus Say.

Tingitidae.

Galeatus Peckhami Ashm. (*Spheroecysta Peckhami*, Ent. Am., vol. iii., p. 156). Swept from low weeds—probably a dwarf vaccinium or a species of aralia, which were growing together—among pines on a rocky island. I am indebted to Mr. Uhler for this generic reference. The three examples taken agree in every respect with Mr. Ashmead's description, and I think there can be no doubt of their identity.

Corythuca arquata Say. (?). The small form, which is probably a distinct species, occurred abundantly on birches everywhere. I have taken it from osier bushes at Machias, N. Y., also at Pine Swamp, near New Haven, Ct. If distinct it would seem to be the northern analogue of *C. arquata*.

Corythuca marmorata Uhl. One example.

Aradidae.

Aradus quadrilineatus Say.

Aradus rectus Say.

Reduvioidae.

Coriscus subcoleoptratus Kirby.

Coriscus inscriptus Kirby. Common.

Coriscus fesus Linn.

Sinea diadema Fab. Scarce.

Opsicetus personatus Linn. Bracebridge. One example.

Hydrobatidae.

Hygrotrechus remigis Say.

Limnotrechus marginatus Say. Abundant in favorable localities.

Limnoporus rufoscutellatus Latr. One example.

Metrobates hesperius Uhl. Muskoka Lake. On pleasant afternoons, when the surface of the water was smooth, these insects would congregate in immense numbers, closely covering an area of several yards in extent. A breeze, sufficient to slightly ruffle the surface, would quickly disperse them, but whither I failed to discover, as I was unable to detect any along the shore. The majority of the specimens taken were immature; they differ from the adult in having five, pale yellow spots in addition to the pronotal—one on the centre of the metanotum, one above each anterior, and another before each posterior coxa.

Salididæ.

Salda interstitialis Say. Common along the shores of the river and lake.

HOMOPTERA.

Cicadidæ.

Cicada canicularis Harris. The familiar shrilling of this species was frequently heard in the heat of the day among the tree tops.

Membracidæ.

Enchenopa binotata Say. Apparently rare.

Ceresa bubalus Fab. Common, but mostly of the small dark coloured variety, with blunt thoracic horns.

Ceresa diceros Say. Occasional.

Telamona coryli Fitch. Abundant on the hazelnut. The females are frequently of an almost uniform brownish-ferrugineous, with but slight indications of the pale bands, thus approaching closely the next, from which it probably is not distinct.

Telamona tristis Fitch. Common with the preceding.

Telamona fagi Fitch. One example.

Telamona reclinata Fitch. Three examples. Variable both in colour and form of the crest; this being sometimes sharply angled behind, or again obtusely rounded; and the posterior edge may be either sloping or almost vertical. The present examples are very dark in colour, the pale areas being much obscured by fuscous punctures.

Carynota marmorata Say. Numbers taken from a small poplar bush (probably *P. grandidentata*), on the uplands south of Bracebridge.

My examples correspond with Say's short description, except that the tip of the thorax extends to, and in some cases beyond, the apical areole. According to the characters given by Say, it must belong here and not to *Cyrtosia*, where it is placed by Dr. Fitch.

Smilia camelus Fab. Two examples beaten from oaks.

Cyrtosia van Say. Not infrequent on trees.

FULGORIDÆ.

Sub-family *Cixiidae*.

Cixius stigmatus Say. Not common.

Cixius pini Fitch. Occasional on various low bushes ; rarely on pine.

Near Buffalo I have taken it only on *vaccinium*.

Oliarus quinquelineatus Say. More abundant than the preceding forms.

Sub-family *Delphacidae*.

This family was well represented, but I have not studied the material taken.

Sub-family *Achelidae*.

Two undetermined species of this family occurred in single examples.

Sub-family *Derbidae*.

Otiocerus Coquerbertii Kirby. Not uncommon on maple and beech trees.

Otiocerus Degeerii Kirby. Beaten from oak and beech trees. Another small and probably undescribed form occurred, which I had the misfortune to lose while in the field.

Anotia sp. One example taken among bushes on the bank of the river at Bracebridge. It is, perhaps, a variety of *Bonneti* Kirby.

Lamenia vulgaris Fitch. Abundant and of large size.

Sub-family *Issidae*.

Bruchomorpha oculata Newm. Abundant in damp grassy localities, especially on the lowlands. One example has the elytra fully developed. They are long and narrow, somewhat surpassing the

abdomen in length ; sides parallel, not widened at tip ; of a deep smoky-brown colour, almost opaque. Nerves very strong and simple, the radial and two ulnar nerves run straight and undivided to the transverse nerve, which crosses the elytra a little beyond the tip of the clavus, forming three large cells on the base of the corium ; the second ulnar is forked at the transverse nerve, the first ulnar is twice forked beyond the transverse, and between this and the radial is a short nerve from the transverse to the costa ; these forming seven apical cells, of which the medial is small and triangular, and the next inner the largest and rectangular ; the claval nerves unite beyond the middle, the resulting nerve joining the claval suture just before its apex.

Peltonotus histrionicus Stal. One example. Occurs also at Buffalo.

Cercopidae.

Lepyronia quadrangularis Say. Rare.

Aphrophora quadrinotata Say. Very abundant on the lowlands, but mostly immature ; the imagines were just beginning to appear.

Aphrophora parallella Say. Common on pines.

Aphrophora saratogensis Fitch. Rather more abundant than the preceeding, with which it occurred and which it greatly resembles ; it is, however, readily distinguished by the more obtuse head, clearer markings, and concolorous punctures.

Clastoptera obtusa Say. Very common on the blueberry.

Clastoptera proteus Fitch. With the last.

Bythoscopidae.

Idiocerus pallidus Fitch. Abundant on willows, birches, etc.

Idiocerus suturalis Fitch. On low poplar bushes near the river ; even more abundant than the preceeding.

Idiocerus lachrymalis Fitch. Numbers of this, our largest species, occurred on birch and other trees.

Idiocerus alternatus Fitch. Scarce. It is with slight misgivings that I place this insect here, although I believe future study will justify the reference.

Agallia novellus Say. As abundant at Muskoka as in New York ; on grass and weeds.

Agallia flaccida Uhl. But few of this common species were seen at Muskoka.

Agallia siccifolia Uhl. Not uncommon in dry pastures.

Pediopsis viridis Fitch. Apparently rare.

Pediopsis variabilis Fitch. Examples occurred of varieties *A.* and *C.* of Fitch, and a single specimen of a uniform ferrugineous, with pale yellow elytra crossed from the shoulder to the apex by a broad ferrugineous band.

Pediopsis minor Fitch. Two examples.

Pediopsis fenestratus Fitch. A common species on birch trees.

Tettigonidæ.

Oncometopia costalis Fab. Very abundant among coarse weeds and grass, particularly near South Falls, where the pretty striped nymphs occurred with the newly developed imagines.

Diedrocephala coccinea Forst. Not uncommon on blackberry bushes.

Diedrocephala mollipes Say. Common.

Diedrocephala novæboracensis Fitch.

Helochara communis Fitch. Common.

Euacanthus orbitalis Fitch. A few examples taken.

Gypona 8-lineata Say. The form named *flavilineata* by Dr. Fitch occurred abundantly on various trees and bushes. I place this variety with *8-lineata* Say, as it seems impossible, on a superficial examination, to find any constant characters for separating the two forms, although they have every appearance of being distinct species. Some of the examples taken exhibit no indications of the yellow lines on the head, pronotum and scutellum, while all are extremely variable in the elytral venation. A careful study of our northern species of *Gypona* is needed.

Jassidæ.

Acocephalus vitellinus Fitch. One example.

Grypotes unicolor Fitch. Not uncommon.

Cicadula (Macrosteles) quadrilineata Forbes. A few examples of this common species occurred on cultivated lands. Near Buffalo it is

quite variable, some individuals corresponding very closely with Mr. Uhler's description of *Jassus divisus*, with which this may prove identical.

Thamnotettix eburata n. sp. Form and aspect of *clitellaria* Say, to which it is closely related. Above brown with a large white discal spot, beneath white; venter marked with black and yellow ♂, or whitish ♀. Vertex pale yellow, whitish on the base, slightly suffused with ferrugineous on each side near the eye; a central impressed line extending about half way to the apex. Face whitish, slightly tinged with yellow. Antennæ white, setæ brown. Pronotum and scutellum dark ferrugineous or fuscous, the latter paler with a transverse impressed black line before the apex, behind which the edges are narrowly yellow, and slightly calloused. Hemelytra;—Clavus fuscous, the common disc with a large, obtusely cordate, ivory white spot which is slightly suffused with yellow; behind this spot is a dark area. Costal half of the corium milky white, almost opalescent, tip broadly fuscous; discal half brownish ferrugineous, paler posteriorly, and shading to fuscous along its junction with the white costal area. Beneath and legs white, immaculate; small spines at tip of the tibiæ and tarsal joints slightly embrowned; claws black. Venter black, posterior edge and disc of the segments yellow; the latter with a central black line, represented by dots on the three basal segments; convexum yellow; tergum black. Wings milky hyaline, veins faintly brownish. The female differs from the male in being somewhat paler, in having the discal spot of the elytra more yellowish, and the abdomen pale yellow or whitish. In the venation of the elytra and other structural features this species agrees very closely with *clitellaria*. The ♂ has the last ventral segment slightly concave posteriorly; valves obtusely triangular, black; plates white, sparsely covered with long concolorous hairs. The ♀ has the last ventral segment black, with the lateral margins pale; as in *clitellaria* it is deeply incised each side of the middle, leaving a central tongue, which is minutely emarginate at tip; pygofer pale, suffused with brown toward the central groove, and fringed with long pale hairs. Length, ♂ 5 mm.; ♀ 5½–6 mm. A male was swept from grass near a rivulet at Bracebridge; also taken in the vicinity of South Falls.

Athasanus striola Fall. Occurred abundantly near South Falls, on a low meadow overgrown with swamp grasses ; here they were of large size, measuring in some cases 6 mm. to tip of the elytra ; elsewhere, scattering and of normal size.

Allygus irroratus Say. Taken in moderate numbers. Both the normal form and the large variety, with the vertex produced and flattened, occurred together here as elsewhere ; the variety predominating in moist situations.

Jassus immistus Say. Common among low bushes and briars. This pretty insect seems to be congeneric with a form occurring near Buffalo, of which I have seen specimens in the National Museum labelled *Scophoideus jucundus* Uhl. A third and undescribed species occurred to me at Muskoka.

Platymetopius acutus Say. Moderately abundant.

Deltocephalus debilis Uhl. Rare. Occurs also at Buffalo.

Deltocephalus configuratus Uhl. Abundant here as elsewhere.

Deltocephalus sayi. Fitch. Scarce.

Deltocephalus inimicus Say. Very common on cultivated lands.

Typhlocybidæ.

Several species of these minute insects occurred ; but as the North American species have been but little studied they are omitted from the present list.

Psyllidæ.

Psylla carpini Fitch. Abundant on the blue beech.

Aphididæ.

Want of time precluded any attempt at collecting the *Aphididæ* and *Coccidæ*.

In addition to the 141 species here enumerated a number of doubtful forms were taken, belonging mostly to the Homoptera ; giving a total of something over 150 species as the fruits of ten days collecting.

FURTHER NOTES ON CHIONOBAS JUTTA.

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

Our President has asked me what methods I adopted for the raising of *C. jutta* from the egg. I will endeavour to describe them.

As it is well known that larvæ of the genus *Chionobas* feed on grasses, my first care was to determine what grasses were to be found in the haunts of *Jutta*, and to notice the circumstances under which they grew. I found several, all rooted in the sphagnum of the swamp. I took home roots of every kind, and potted them in sphagnum, being careful to close the hole in the bottom of each flower pot with a cork, and to soak the plants thoroughly with rain water. I soon had a number of thriving plants. I placed the pots containing these—so near together that some of the blades of every plant intermingled with blades of the rest—in a box of convenient size; and I filled up the interstices, to the level of the rims of the pots, with sphagnum. I then made a slight, arched lattice over the top of the box, and stretched a piece of green netting over it. My cage was then ready. When *Jutta* was pretty well worn, *i. e.*, about the 12th of June, I captured two or three females, and placed them in my cage. On the 17th of that month I found a number of eggs, not laid on the blades of grass, but scattered over the netting. When the larvæ appeared, I placed, by means of a camel's hair pencil, a few of them on each plant; but I soon found that they congregated on the sedge. This then, I concluded, was their favourite food-plant. I kept the cage on the seat of an open window with a north-western aspect; and, whenever it rained I removed the covering of the box, and let the insects have the benefit of the shower. In dry times I occasionally sprinkled them at sunset with soft water.

In August I noticed that my insects were seriously decreasing in number. As their habits were unknown I thought it possible that the vanished specimens had buried themselves in the sphagnum, and would in due time again appear; but a wounded larva, that had evidently been nipped by a foe, at length aroused my suspicions. I procured fresh plants of sedge, placed upon them all the larvæ I could find, and then spread a large sheet of paper, and upon it pulled all the old bedding to pieces. The result was that I found, not the lost larvæ, but several very well grown specimens of *Lithobius Americanus*. I consider this creature therefore a

foe to be guarded against. On the approach of winter the care of *Jutta* became perplexing—the more so as I was about to leave for England. I at length resolved to place the case, near a window, in a outer passage leading to a dairy. There it would be, I thought, sufficiently removed from the warmth of the house, and would escape the crushing weight of the winter's snow. I left the larvæ supplied abundantly with sedge growing in well soaked sphagnum. On my return in February only six of the larvæ remained. They were torpid, but fresh and plump. A mild day came, and one of the larvæ revived ; but the mild day was followed by a bitter night, and the adventurous larva perished. When the others began to revive I moved the cage into a room where the temperature could be better regulated. Of the remaining larvæ one afterwards died and four went into chrysalis. The chrysalids were naked, unattached, and lay on the surface, or just below the surface of the sphagnum. I sent one of them to Mr. W. H. Edwards, and one I preserved as a specimen. The other two produced butterflies. The first of these appeared on the 31st of May, and was crippled. I thought that perhaps I had kept the chrysalis too dry, and I sprinkled the one remaining with fresh water. Next day a beautiful and fully developed female *Jutta* presented itself, crowning my efforts with success. It was as large as the largest specimens I had taken in a state of nature. The only difference I could perceive—and it was hardly perceptible—was that the insect raised in captivity was of a somewhat paler brown than the others.

ONE WORD MORE ABOUT RILEYA.

BY L. O. HOWARD, WASHINGTON, D. C.

(See Mr. Ashmead's communication in December CAN. ENT.)

Without entering further into the discussion of priority, beyond stating that Mr. Ashmead is wrong in his points (1), that my original communication was read after the publication of his synoptical table, (it was read two days before the receipt of the number of *Entomologica Americana*, in which the table was published), and (2), that his full description was published before mine ; (mine was published nine days before the receipt of the Kansas bulletin). I wish to say just a word in reply to his supposi-

tion as to the identity of *Lonchocerus* Dahlbom and *Riley* Howard. His statement that I had not consulted the European literature is, of course, uncalled for and absurd. I had not only familiarized myself with the European descriptions, but had sent specimens to Dr. Mayr, who so ably monographed the European Encyrtinæ some years ago, and whose opinion corroborated my own as to the novelty of this form. Mr. Ashmead's comparison of Thomson's description with my own must have been most hurried, as they differ so widely that I would advise him to retract his expressed opinion for the sake of his entomological reputation.

I tabulate here the differences which can be noted from comparison of the two descriptions and my figure of *Riley*. The quoted portions in the *Riley* column are from the description, and the unquoted portions can be verified from the figure. *Lonchocerus*, by the way, is nothing but a synonym of *Mira*, if Thomson is right in supposing that Dahlbom founded the genus for Dalman's *Encyrtus platycerus*. Dahlbom's genera in the Encyrtinæ were described, however, without any indication of types.

RILEY HOWARD.

"Face * * * gently rounded, and has a strong, glistening, transverse, clean-cut ridge just above the insertion of the antennæ."

Antennal club not jointed.

Mesoscutum transverse, "highly polished."

"The mesoscutellum has a strong tuft of erect, black hairs" at tip only.

Wings not shortened; when closed reaching considerably beyond tip of abdomen.

"The stigmal vein is given off immediately at the juncture of the submarginal with the costa." Consequently there is ~~no~~ marginal vein.

Abdomen flattened ovate, cutely pointed behind, "highly polished."

LONCHOCERUS DAHLBOM.

"Caput subtriangulare, vertice sat lato, lateribus tereti, medio subacuto."

"Clava 3-articulata."

"Mesonoto [mesoscutum] haud transverso, dense albo-sericeo."

"Scutellum dense holocericeo - pubescens."

"Alæ abbreviatæ, Thorace vix superantes."

"Stigmate [marginal vein] lineari, distincto."

"Abdomen subglobosum, dense albo-pubescens."

In conclusion, I wish to apologize for the slip (or misprint) in the use of "1887" for "1888." The change does not alter the relative order of the events, and the date of reading the paper is unimportant.

POPULAR AND ECONOMICAL ENTOMOLOGY.

WINTER COLLECTING.

BY JAMES FLETCHER, OTTAWA.

At the last annual meeting of the Entomological Society of Ontario, it was decided that every month there should be at least one short article upon the above subject. The Council consider it wiser not to increase the size of the CANADIAN ENTOMOLOGIST at the present time, but to take two pages from the space we now devote to Scientific Entomology. It is true the space at our disposal is all too small to accommodate the valuable articles sent in by our friends, but the demands are so frequent for articles of the nature mentioned, that it has been decided to try the experiment of having them regularly, and it is thus hoped to largely extend the influence of the Society by inducing more lovers of nature to take up Entomology as a study, and by providing agriculturists and horticulturists with short and simple accounts of their insect enemies and the latest discovered remedies. It has been suggested that the winter is an inappropriate time of the year to begin such a series of articles ; but upon slight consideration this will be found to be not at all the case. In the continuous chain of nature, great interest will be found at every link and thing unexpected, strange and of marvellous beauty will appear at every point. Even in Canada, snow and ice-bound for so many months in the year, there is much collecting which can be done in the winter. A favorite occupation of the writer is to go off collecting with a congenial companion upon snow-shoes. The charm of this pleasant exercise in which, supported by the light snow-shoes, one can visit places inaccessible during the summer, is in no way diminished by being able to take home with you specimens which will afford ample occupation for many evenings. Starting off in a straight line many objects of interest are met with as we go along, across field and fences, through woods and swamps and over rivers, hills or even mountains, all levelled and smoothed down to an even surface by their thick covering of ice and snow. In passing through the woods and swamps cocoons are eagerly looked for on the slender boughs of trees and shrubs. It is seldom that we are not rewarded with cocoons of the large Emperor moths. In crevices of bark and beneath moss, many hibernating insects are discovered of several orders. Larvæ of moths and chrysalids of butterflies, beetles and hemiptera. One of our annual trips is to a certain

tree for the pretty little homopteron, which forms galls on the leaf of the hackberry (*Psylla Celtidis-mamma*, Riley), and which passes the winter in a torpid state beneath the scales of the bark of the hackberry, the color of which it closely resembles. In passing through the swamps, tufts of moss are pulled from any exposed hummocks to be picked to pieces at home when they have thawed out. Here will be found many treasures which we have not found in any other way. Every cluster of leaves adhering to a deciduous tree or swelling upon a stem has to be examined for the cause, and if it prove to be the work of insects, must be put into the bag for examination. The only apparatus necessary for these expeditions is a bag slung over the shoulders and a stick with a hook on one end and a spike on the other; the bag acts as a large pocket, and saves the inconvenience of unbuttoning your coat, when, perhaps, the thermometer is below zero. The hook on the stick is useful for pulling down boughs or pulling yourself out of a hole; the spike for prying off pieces of bark or digging into old stumps.

Objects of great interest, some of which can be better collected, and from which the insects can be more successfully bred when collected in the winter time, are the various kinds of plant galls. These require little trouble, all that is necessary is to put them away in glass jars and keep them closed. After a time the occupants begin to emerge, and to the surprise of the uninitiated, although each kind is made by only one kind of insect, from the galls will be produced perhaps half a dozen distinct species. These are most of them parasites upon the gall-maker, or what are known as inquilines or guest flies. The gall-maker produces the gall upon the plants. In this gall some of these guest flies deposit their eggs, and the young grubs feed upon the substance of the gall, or others again live as parasites, either upon the grubs of the gall-makers or their guests. Watching these as they emerge and making notes upon them, will be found most entertaining at a time of the year when there is little active life out of doors. A further zest is added to this department of study from the fact that so little has been done in this line, that many of the flies so bred will be new to science.

Other places which may be visited in the winter, are groves of evergreens where much will be found to repay the collector. Amongst the leaves of the pines are cases of larvæ, and in the leaves themselves are the burrows of the caterpillar of a tiny moth. Beneath the bark are numerous scolytid bark-borers, and from the solid wood beneath may be ex-

tracted the large grubs of the timber borers; to obtain these last, however, an axe will be found necessary. In the garden the horticulturist will find plenty of work with which to occupy himself profitably. The egg masses of the tent caterpillars should now be collected and destroyed as well as those of the Tussock moths. Clusters of dead leaves should be removed from apple trees and their stems cleared of the scales of the oyster-shell bark louse and other small insects which winter in rough places on the bark or amongst the buds.

In addition to the above work out of doors, much is to be done during the winter to prepare for the work of the coming season. Apparatus and storing boxes for specimens should be prepared well beforehand, or, perhaps, when the time comes to use them, opportunities will be lost. Some simple elementary book should be procured and read at leisure. In our library at London, we have for the use of our members, many books of this nature which can be borrowed by applying to the librarian. We should recommend to beginners Kirby & Spence's Entomology, Packard's Entomology for Beginners, and Comstock's Introduction to Entomology.

PHILIP HENRY GOSSE.

On Thursday the 23d of August, Philip Henry Gosse, departed this life at St. Marychurch, near Torquay, Devonshire. He was born at Worcester, on the 6th of April, 1810, and early displayed a taste for natural history. In 1827, he was engaged as clerk in the extensive mercantile house of Messrs. Slade, Elson, Harrison & Co., of Carbonear, Newfoundland. In June, 1835, he removed with his friend, Mr. G. E. Jacques, (now living at Cowansville, P. Q.,) to Lower Canada. He bought a farm one mile east from Waterville, on the River Coaticook. During the summer he cultivated his land, and in the winter he taught the Compton village school. At this time he collected the materials for his first work, the *Canadian Naturalist*. The rough life of a Canadian farmer, in a comparatively new settlement, was ill-suited to this young man of refined tastes; and the "noisy politics" and "martial alarms" of the times must have jarred on his ear, attuned as it was to the music of nature. Then, too, the people of the neighborhood were not of a class to appreciate his studies. They were wont to speak of him as "that crazy Englishman

who goes about picking up bugs." It was well for him that as a naturalist, to use his own words, he could find "gratification in any scene and at any season," and that in Mr. Jacques, in whose house he boarded, he had a congenial friend. In Chapter viii. of his work, he draws a gloomy picture of an Eastern Township farmer's life; but in the preface (which breathes the modesty and piety which characterized him through life), he says:—"During a residence of some years in the Lower Province, the author has felt it to be no common privilege to be able to solace himself by these simple but enchanting studies * * * and even now the recollection of those pleasant scenes sheds forth a lustre which gilds the edge of many a dark cloud."

In March, 1838, Mr. Gosse left Compton, and settled in Alabama for about six months. His observations at this period afforded the subject matter of his *Letters from Alabama, chiefly relating to Natural History*. He returned to England in the spring of 1839, and published the *Canadian Naturalist* during the summer. On the 10th of August, 1844, he sailed for Jamaica, to study the natural history of that island. After a residence there of two years, he went back to England, and published the result of his investigations, under the title of *The Birds of Jamaica, A Naturalist's Sojourn in Jamaica*, and *An Atlas of Illustrations*.

From January, 1852, to the time of his death, Mr. Gosse's residence was at St. Marychurch, where he had a delightful residence which he named "Sandhurst." Attached to this were extensive conservatories, including a vinery, fernery, orchid houses, etc.

For some years, he was engaged in preparing works for the S. P. C. K. After that he devoted himself to the microscopic study of the British Rotifera. In 1856, he was elected a Fellow of the Royal Society. He was an indefatigable worker, usually in his study by four o'clock in the morning in the summer, and by six o'clock in the winter, and producing on the average two works in the year. His books must number about forty; and among the scientific papers of the Royal Society upwards of fifty are from the pen of Mr. Gosse.

Among his works are:—*Tenby, A Sea-side Holiday*; *The Aquarium*; *Actinologia Britannica*; *A History of the British Sea Anemones and Corals*; *The Wonders of the Great Deep*; *The Romance of Natural History*; *Life in its Lower, Intermediate, and Higher Forms*; *Land and Sea*, and *A Year at the Shore*.

Always of a religious turn of mind, he delighted in sacred history and Biblical studies ; and a number of words of a sacred and historical character proceeded from his pen. The last of these, published in 1884, was entitled, *The Mysteries of God, a Series of Expositions of Holy Scripture*.

One cannot often point to a life more pleasantly and usefully spent than that of Philip Henry Gosse.

THOMAS W. FYLES.

CORRESPONDENCE.

DANAIS ARCHIPPUS.

Dear Sir : I send you my season's observations on the movements of *D. archippus* in this locality. The spring of '88 was an unusually backward one here, cool, dry weather prevailing, which will, of course, affect all the dates more or less. I commenced by watching for the appearance of milk-weed *Asclepias cornutus* in two places where it grows in abundance ; one, a flat to the west of the city, protected on the east and north by a high bank ; the other to the east along the foot of the Niagara escarpment, a very warm spot when the wind is not north-east. On the 4th of June, I could not see a sign of its coming through the ground ; on the 5th, I went to the country, about 26 miles north of this ; they had more rain there, and *A. cornutus* was from three to six inches high ; on the 7th, I saw my first *D. archippus* of the season, but they did not appear in any great numbers whilst I remained. On my return, I visited the west end on the 26th, there were a few flying about the weed, which was then from ten to fourteen inches in height with blossom clusters not yet expanded. I captured three—two males and a female, and saw a larva about one inch long and as thick as a wheat straw. In the same locality, on 3rd of July, I counted seven on the wing at one time, flying vigorously, and took two males, and felt sure from their movements the others were the same. On the 5th went east, milk-weed in full bloom, *archippus* abundant ; captured two males, and suspected all the others to be the same ; could find no larvæ ; took fresh hatched *Milberti* and saw plenty of fresh *Atalanta*. Went west on the 7th, not many on the wing, and could find very few larvæ. Was at Guelph for ten days on the 16th, and visited the Agricultural College. Prof. Panton showed me chrysalids reared in confinement.

On the 21st, at the west end, captured a freshly hatched male ; found no larvæ ; leaves of weed showing little signs of being eaten. 25th, same place ; butterflies plentiful ; freshly hatched mingling with old broken ones ; took a fresh female. East on the 27th ; butterflies not plentiful ; saw a few larvæ nearly full fed. 28th, west ; not so plentiful as on the 25th. From the 2nd to the 18th of August, I was in the vicinity of Brantford—25 miles west from Hamilton ; there were few *D. archippus* to be seen, but all were fresh ; yet there was an abundance of *asclepias*. On the 20th, was at the west end ; larvæ scarce ; saw one not half an inch long ; took one full fed, which suspended that night, and pupated the following night ; there were very few *archippus* about the milk-weeds, which were now four and a-half and five feet high. From the 1st to the 17th of September I was 16 miles south of here ; there I saw several fresh *archippus*, but not a single stalk of *asclepias*. On the 21st was at the west end ; *archippus* had completely deserted the milk-weed ; I saw some feeding in a garden some distance away. My impression has been for a good while that the butterflies care but little for the milk-weed to feed at ; that they are there for breeding purposes principally ; that they are but light feeders, with a great fondness for loitering in open woods, where there is apparently nothing for them to feed on. My last observation was made on the 15th of October ; the milk-weeds were still green at top, but the lower leaves were all decayed. I have seen no butterflies since the 21st of September.

J. ALSTON MOFFAT, Hamilton.

SOME COLEOPTERA NEW TO COLORADO.

Dear Sir : Dr. John Hamilton has been good enough recently to examine some Coleoptera which I collected in Custer County, Col., and among them he finds five specimens new to the State List. One, *Ditylus obscurus*, was obtained in the eastern portion of the county, the other four are from near Swift Creek, at 8,000 to 8,500 feet altitude, and are as follows : *Aphodius brevicollis*—which Dr. Hamilton says was previously known only by a single specimen found in Nebraska ; *Hister Harrisii*, Kirby ; *H. subopacus*, Lec.—three specimens obtained ; and *Lebia vivida*, Bates. Among my beetles from Eastern Custer Co. was also an example of *Pityophagus verticalis*, which Dr. Hamilton says was previously known by a single specimen only.

Sept. 7th, 1888.

T. D. A. COCKERELL, West Cliff, Colorado

Mailed January 4th.

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THE LEPIDOPTEROUS FAUNÆ OF EUROPE AND NORTH AMERICA.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

The study of representative species of butterflies and moths shows us that very different grades of resemblance exist between allied forms inhabiting Europe and North America. I have shown that the modification shows itself sometimes mainly in the larval state ; again the perfect insects depart more or less strongly. I have also ventured to decide that these representative species are entitled to specific rank in our nomenclature. They fulfil the condition of species, since they do not intergrade, and they can be distinguished quite surely by competent specialists. The study of these representative species leads to the question of their relation, and we have seen that they may be regarded as survivals of a former northern, circumpolar fauna, which was broken up and driven southwards by the Ice Period of geologists. I have originally tried to show, in Silliman's Journal, that we have in our Lepidopterous fauna different elements. The representative species belong to this ancient circumpolar fauna. And here belong in part the identical species like *Vanessa antiopa* or *atlanta*. The identical species have remained unaltered, but certain species have been introduced by commerce, as the White Cabbage Butterfly and perhaps the Currant Borer, *Sesia tipuliformis*. The certain separation of these two sources of North American species belonging to the circumpolar element requires historical data which will hardly be forthcoming. The second element is that which comes to us from the south, a return wave of the migration southwards, which set in on the advent of the Glacial Age. This southern element is divisible into such forms as have already firm foothold, and such as the physical phenomena of the Gulf Stream, the prevailing air currents during the summer, land as wind-visitors upon our shores. *Erebus*, *Aletia*, *Euthisanotia*, among the moths, are more or less

partial breeders in our territory. How far north the permanent residence of the Cotton Moth obtains is not yet known. I am the first to point out that it is winter-killed over much of the territory which its summer migrations cover as a moth. I have seen how the migration takes place. The moths crawled out in numbers on my plantation during one or two days, and I anticipated a third and more destructive brood of caterpillars. The next morning not one perfect moth was to be seen. On the ground crawled a few cripples with unexpanded wings, to be killed by the sun and the ants. There was no third brood; the moths had migrated, been swept by the winds to the north during the night. I have alluded to the influence of the winds upon the time of arrival of the Cotton Moth on the Atlantic coast.

The "original" part of my work on the Cotton Worm was my discovery that it hibernated in the moth state; that it was winter-killed over a part of the territory it occupied both as larva and moth during the summer; that in the south it had no other food plant than cotton. I accounted for the moths in Canada in the fall by considering them wind-migrants. No alternative food plant is known in the north. In the south, as I originally stated, the worms migrate from eaten-out cotton fields, leaving the weeds and vines untouched, in search of fresh cotton. I identified the insect with the South American *Aletia argillacea* of Hübner, and stated my theory which I arrived at from a study of the habits of the moth and from a knowledge of the cotton plant itself, which like its parasite is not indigenous with us. Both have changed their normal condition. Man brought the cotton plant, which under culture and in our climate has become an annual, itself winter-killed in part, but so more productive of cotton; the winds brought the moth and the cultivated cotton fields supplied abundant food. I pointed out the yearly seasonal spread of the moth from south to north.

But to leave the special subject of the Cotton Worm, which is interesting by itself as illustrating one of the sources of the southern element in our Lepidopterous fauna, and to proceed with our analysis. The third element in our fauna is that which is North American *per se*, that is, which is descended from a pre-Glacial North American fauna, or which has become so modified from its original source as to be classed as North American. Here is a very difficult study in a consideration of the characters of our Lepidoptera. I have taken *Cressonia juglandis* as a

type of a North American moth descended from a pre-Glacial North American ancestor. I have taken *Datana* as an example of a North American moth which has become so modified from its original source as a member of the ancient circumpolar fauna, the first element in our present North American fauna, as to be now classed as North American. In the same group I take *Apatelodes* as an example of a North American moth which has become so modified from its original source as a member of the tropical, or South American fauna, as to be now classed as North American. The *Ceratocampinae*, the genus *Hyperchiria*, I regard as ultimately of Southern origin. The genus *Catocala* belongs to the first element in our fauna; it is a development from a former circumpolar fauna.

But not to go further for the moment in this direction, let us compare the American and European butterflies and moths in a more general way, so as to arrive at some conclusion with regard to the departure from a common type in the members of the circumpolar fauna. The first thing which strikes us is the comparatively greater tendency to variation, to splitting into species which characterizes the North American butterflies and moths. Take the genus *Colias*, which belongs to the first element in our fauna; how it wanders into distinct forms, sometimes still connected, again no longer now members of the same reproductive cycle. Without Mr. W. H. Edwards's observations on the larva, we should be quite at sea.

But now, compare our protean *Colias* species with the two set European forms! What is true of *Colias* is true in other genera. Take the genus *Datana* among the moths; this is an American out-growth of the European *Phalera*. Now in Europe there are two closely allied forms of *Phalera*, *bucephala* and *bucephaloides*, but they are to be at once picked out by a slight but constant difference. In America we have six or seven species of *Datana*, and, if we take out *Angusii* and *perspicua*, as being distinguishable by general colour, all very near and difficult to distinguish as moths. In the genus *Clisiocampa*, the same phenomena are repeated. See how variable the underwings are and how much difference of opinion exists among writers! I am of opinion that *Catocala residua* is a good species, but Mr. Hulst is not with me here. At the best we can say, that Mr. Hulst, in regard to other species and varieties (e. g. *praeclara*, *herodias*, *gisela*), has corrected himself and adopted my views, and that he will also probably come in time to agree with me in regard to *Alabama*,

Whitneyi and *residua*. We have seen, that the more correct determination of the moths alone is a matter of scientific experience, inborn feeling, in short of tact which comes alike from long work and genius for the study. The check to all such determinations of the perfect insects is breeding from the egg.

In the North American fauna, we also have the European genus *Scopelosoma* ; in Europe with one constant form, in North America with several closely allied. How thankful I am, that Mr. Thaxter has bred our closely allied species, so that no opinion formed from the imagines alone is now worth having or recording.

As the result of our comparison, we see the fact that species tend more to vary, to wander off into new forms in North America ; whereas, in Europe, they have a greater setness, or fixity in their appearance. It would seem as if the faunal changes in America had been greater, influenced by physical causes, the chain of longitudinal mountains, the land connection of the tropics, the course of the winds of the gulf stream, all the phenomena of climate and temperature. The probability is, that the European species are nearer the old circumpolar pre-glacial forms ; that in most cases the North American forms have made the variation, the step in a new direction.

Species by species, genus by genus, must these comparisons be made, so that we may unroll the probable past of our butterflies and moths. The life-histories must be known and compared. Work like that done by Mr. W. H. Edwards, Mr. Thaxter, Prof. French, Mr. Beutenmüller and others must be encouraged. Some papers by Mr. Moffat, on the question of species and variety naming, recommended themselves to me greatly. At the risk of repeating myself, I maintain that, as an entomologist, we are here to discriminate, not to lump ; our work is to talk about and illustrate the differences we find in insects.

An intelligent resolving of the study into its different phases is much needed. While with patience, the fine work of discriminating the forms is being carried on, the labour of comparisons, for the purpose of aiding the solution of wider questions, should not be neglected. There is enough to do, and I am glad to see, as the years go by and fresh workers come into our field, that there will be enough to do it. It is the pursuit of truth that is always new and interesting.

A NEW SPECIES OF NEONYMPHA.

BY G. H. FRENCH, CARBONDALE, ILL.

Neonympha Mitchellii n. sp.

Expanse of wings, male, 1.20 to 1.30 inches; female inches.

Male.—Upper surface grayish wood-brown, rather dark, without spots or marks, except that the spots on the underside of the hind wings and the dark lines bordering the terminal dark yellow line on the same wings show through a little. Fringes concolorous, in certain lights a little smoky tinged. Under surface slightly paler than the upper, a little more of the mouse order of color, sprinkled with buff scales. Both wings are crossed by four transverse brownish-yellow stripes, so dark on the fore wings as to be yellow-brown, occupying the same position as the same lines in its ally, *N. Arcolatus*, the first and second uniting by a rounded end about a tenth of an inch from the inner margin of hind wings, the two outer—one terminal and the other sub-terminal—also uniting before reaching anal angle. In *Arcolatus* these lines do not unite. Each of these lines has a dark brown (more or less distinct) fine bordering line on each side of it. The first line crosses the fore wings a little more than two-thirds the distance from the base of wing to end of cell, the hind wings about two-thirds. The second line crosses fore wing a little beyond the end of cell, the hind wings across the end of cell. The second and third are approximate anteriorly as in *Arcolatus*. Fore wings with a row of four small ocelli between second and third lines, black, circled with pale Naples yellow or buff, the first varying from a dot, the size of an ordinary period, to about twice that diameter; in four examples circular, in two a little oval, in two a silvery metallic centre, the second a little more than twice the diameter of the first; in three examples circular, the other three slightly ovate, each with from one to three metallic points, when three present in the form of a triangle; the third averaging the size of the second, circular, with from one to two metallic points, when one central, when two in line with the row of spots; the fourth about one-fourth larger than the first, circular, all but one, which has the buff circle almost complete on the outside, but also a few buff scales outside the circle, a single metallic point to each of these.

Hind wings with six ocelli to each wing, circled with buff as those on

the fore wings. The first varying from a few buff scales, in one example, without the black centre, to twice or thrice the diameter of an ordinary period, circular, the largest with, in one example, a silvery metallic point; the second about .04 of an inch in diameter (the black portion), circular in four examples, in two a slight bulging in outer anal part, from one to five metallic scales, aggregated or scattered; the third from .06 to .07 of an inch in diameter, all nearly or quite circular, two silvery metallic points, in line with the ocelli; the fourth size of the third and the same shape. In each of these one example has a few black scales projecting into the buff annulus externally on one wing, points as in the third, except that in one the metallic scales are scattered on one wing; fifth of the size of the third, circular, in one example a few buff scales invade the black externally on one wing, in two other examples they are a little irregular in shape externally on both wings, two metallic points to each, with a few scattering scales in two examples; sixth about constant in size, as large as the largest of the first, one metallic point in all but one, ocellus, where the scales scatter a little, circular.

Body concolorous; antennæ above on basal two-thirds colour of wings, terminal orange shading into basal colour; beneath whitish, outer third orange; sides of basal two-thirds brown and whitish.

Female.—Differs from the male in being paler both above and below, and slightly in the arrangement of the transverse lines on the under side. In two of the four before me, the second and third lines distinctly unite with each other near the anal angle, while the lines by which the first and second, and the third and fourth unite are to be seen but are obscure. In one of the others there is no union between the second and third, while there is plain union between first and second, and third and fourth. The fourth has a distinct union between the first and second, and third and fourth, but the rounded ends of these unions touch. Both wings of the same example alike in this character. Ocelli as in the males, with about the same amount of variation.

This species differs from *A. Arcolatus* in the following points:—In *Arcolatus* the fore wing may have three ocelli and vary from that to many, while the hind wings have five. In *Mitchellii* four are always found on the under side of the fore wings, and six on hind wings in both sexes. In *Arcolatus* the ocelli are elongate, the long part the long way of the wing. In *Mitchellii* they are all circular with only a little variation.

In *Areolatus* the metallic points in the ocelli are pale blue, and are arranged more or less in rows in the ocelli lengthwise of the wing. In *Mitchellii* they are, if in rows at all, across the wing. In *Areolatus* the transverse lines on the under side are ferruginous, and the second and third always unite near anal angle of hind wings. In *Mitchellii* they are more of a brownish-yellow; in the males the second and third lines never unite, but the first and second, and the third and fourth always unite leaving a little space between their rounded ends; in the females only one out of four had the second and third distinctly united. In *Areolatus* the metallic points are pale blue. In *Mitchellii* they are lighter, being more of a silvery colour, giving none of the real blue reflection, unless seen at a very oblique light, and then very pale.

Described from six males and four females taken by my friend, Professor J. N. Mitchell, in Cass County, Michigan, to whom I dedicate the species. They were found in upland dry meadows, about ten miles from the Indiana line. Professor Mitchell is of the opinion that the species has been found as far north as Kent County, Michigan.

TWO NEW SPECIES OF TINEIDÆ FROM THE ALEUTIAN ISLANDS.

BY WM. BEUTENMULLER, NEW YORK.

Cerostoma Aleutianella, n. sp.

Head and palpi olive gray; legs olive gray, tibiæ annulated with fuscous; body fuscous. Primaries olive gray, becoming paler toward the outer margin; above the fold is a broken fuscous basal streak, running to a little beyond the middle of the wing; at the end of the cell a small fuscous spot, limited beneath by a white patch. Cilia olive gray. Secondaries grayish fuscous. Underside of wings grayish fuscous. Cilia of the primaries tipped with greenish gray.

Expanse 20 mm. 1 ♂. Coll., Hy. Edw.

Cerostoma Dubiosella, n. sp.

Head, thorax and palpi fuscous. Primaries grayish fuscous, thickly covered with deep fuscous scales; before the outer margin a few white and black scales. Secondaries grayish fuscous, as are also the underside of the wings.

Expanse 18 mm. One example. Coll. Hy. Edw.

NOTES ON BOMBYCIDÆ.

BY FREDERICK CLARKSON, NEW YORK.

The habits of insects present an attractive and fruitful field of discovery, illustrating in many remarkable ways their peculiar instincts governed by heredity, and more or less conditioned by environment. The power which we call instinct, controlling the habits of insects, has a regularity of action governed by ordinary conditions, but there are frequent manifestations of adaptation to circumstance, as conspicuous in the several orders of insects as in the various races of mankind. The extraordinary condition can only be regarded as an obstruction to the usual law that governs instinct, and compels the creature to conform to the changed surroundings. The larvæ of *Bombyx mori* if crowded for space at the time of pupation will associate to the number of three or four in spinning the one cocoon which covers them. The larvæ of *Samia cynthia* under like environment present a similar variation of habit by spinning interior sections one above the other in the silk-lined leaf constituting the one envelope, so that outwardly it has the appearance of a long, single cocoon. The marked feature of this dual cocoon is, that while ordinarily the place of escape for the imago is at the upper end of the cocoon, the inhabitant of the lower section emerges at the lower end of the cocoon, from the lower end of its section. The *Cynthia* worms occasionally, from like necessity, will, to the number of two, spin a cocoon in common and undergo transformation in the one interior section. I have collected the past season very diminutive cocoons of *P. cecropia* and *S. cynthia*, the former measuring one and one-half inches long by one-half inch in diameter; the interior section three-quarters of an inch long by three-eighths of an inch in diameter; the latter was spun on a leaf one and one-half inches long, the cocoon rather less by three-eighths of an inch in diameter. The cocoons contained the larva dead and in a dried condition.

From a cocoon of *P. cecropia* I have obtained a very small male, measuring scarcely four inches in expanse of wing. The kidney-shaped spots on secondaries are reversed from their usual position, the pointed end being directed towards the abdominal or inner margin, instead of as commonly to the exterior margin. The wavy white line, bordered with black, on the exterior margin of the primaries, which is usually more or less pointed into the adjoining lilac, is in this specimen a line corresponding in form with that of the margin of the wing.

NOTES ON COLEOPTERA.—No. 5.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Cicindela. A glance over the catalogue shows many names marked as varieties of others, and a glance into the boxes of any fair collection shows these same to have a diversity of appearance, that in many instances requires an educated experience to reconcile with their being specifically identical; as for example, a green *C. sex-guttata* and a black *consentanea*, or an immaculate green *unicolor* and a black *modesta*. With systematists, size, color and markings have no primary weight in specific identity; that is, when the species are not *made*. It is not here purposed to enter on the relation of races, the determining causes of which are beyond reasonable conjecture and must have been indefinitely remote, since hereditary reversion to a common ancestral type is obsolete, and many varieties breed true to themselves without producing any of the others; but, to protest against the practice some collectors have of ignoring varieties in making exchanges, as sending *vulturina* or *prasina* instead of *obsoleta*; and to advise that they be treated as species. Indeed it is quite possible when their internal anatomy is better known and structures like the sexual organs studied and used in systematic work, as has been done by Dr. Horn in *Corphyra*, some of these varieties may turn out to be species. I take var. *consentanea* and var. *modesta* abundantly in the pine woods of New Jersey near the coast, basking in the sunshine on the white sand, but neither *sex-guttata*, nor *scutellaris*, nor any intervening varieties are found near there, and I doubt greatly whether the opposite sexes would recognize relationship or produce fertile offspring. *C. repanda* and var. *12-guttata* are found in great plenty here and do not appear to mingle, each race confining itself to its own territory—the former to the river shore and benches, the latter to the rocky creeks and adjacent plateaus—and are not known to hybridize or in any way acknowledge kinship. The above recommendation is intended to apply to the other families of Coleoptera as well as to *Cicindela*, and it is believed every race that is distinct should have a name for the convenience of collectors, if for no other purpose.

Dyschirius. The following, with the other named beetles, were taken Aug. 27th, on Brigantine Island, N. J., in a salt marsh on a sandy spot about three feet by two and elevated some six inches above the level of

the ordinary tides: *D. sphaericollis*, 7 sp.; *D. pallipennis*, 2 sp.; *D. filiformis*, 1 sp.; *D. pumilus*, 10 sp.; *Clivina striatopunctata*, 5 sp.; *Bledius politus*, 16 sp.; *B. basalis*, 20 sp.; *Trogophloeus*? sp., 12 spec.; *Rhyssomatus scaber*, 18 sp.; many *Bledius maxillosus* around the base were not collected. The *Dyschirius*, *Clivina* and *Bledius* burrow only deep enough in the moist sand to fairly cover themselves, and their presence is known by the little mounds at the entrance of their excavations. In life the elytra of *Bledius basalis* are pearly white, with the basal declivity black; those of *B. politus* are reddish-yellow and shining, and the thorax is ferruginous, and it may be known from all others of its size by the deep thoracic channel and the sparse coarse punctuation of the thorax and elytra; the head of the male is large, and tuberculate between the ocular ridges; both species extend southward along the coast to Florida. *Rhyssomatus scaber* does not burrow, but lives beneath a thin layer of a confervoid growth that forms on the marshes and about the roots of grass. This little beetle feigns death so persistently that I never saw one move in the least, and the only other Aphodide I know of that has this habit is *Dialytes striatulus*.

Lebia vivida Bates. A specimen of this beautiful little beetle, described from Mexico and introduced into our catalogue on the strength of two specimens taken in Arizona, is in my collection through the kindness of Mr. T. D. A. Cockerell, taken by him in Custer Co., Col., at an elevation of some 8,000 feet, thus showing that it belongs to the fauna of the Rocky Mountains.

Cychrus Lecontei Dej. Most of the Carabidæ have a regular time of appearance, but this does not seem to be the case with *Lecontei*, bright new specimens of which may be found from April to December. I have found them paired in November, in April, and at various times during the summer. It hibernates, as is well known, in logs and under moss and stones.

Chlænium Pennsylvanicus Say is subject to considerable variation in color, size and sculpture, but nothing is seemingly stable enough to form a race or true variety. One of these variations I was once disposed to regard as a species till set right by Dr. Horn. It has pale epipleura, and the side margins of the ventral segments rufous, like *Circumcinctus*; the outer three intervals of the elytra are dark green, contrasting with the dark disk. It occurs here in summer on the river beach, and I have

not seen it inland. I have specimens of it from Missouri, New York and Canada labelled in error, *tricolor*.

Harpalus vulpeculus Say appears late in the season, and then the thorax is rufous, but becomes black in some individuals after hibernating. This tendency to *melanism* has not been observed in *H. dichrous*, which occurs with it, and has likewise a rufous thorax. *Stenolophus conjunctus* appears in summer and autumn, and then its thorax is rufous; in the fall it becomes gregarious, and winters under rails and stones in grassy places, after which the thorax is entirely black.

Tachycellus Kirbyi Horn is not met with every day, as it lives in grassy places in boggy swamps in their natural state, mostly inaccessible except in the dry part of the season. It is usually found about the roots of tufts of grass. A good way to take swamp beetles is to spread an armful of cut grass over some wet, bare place in the swamp, and on turning it over every three or four days some otherwise rare insects may be taken, as *Pterostichus patruelis*, which here inhabits swamps. Along with it is found plentifully a common species of *Stenolophus*, yet undescribed, that goes in with *ochropezus* or *plebeius*, as the collector fancies.

Pocadius helvolus Er. Whoever desires this beetle may take it during August in a growing *Licoperdon*, which when ripe is commonly known as puff-ball. A dozen or more are often taken in a single one, and are of all colors from ferruginous to nearly black; but young puff-balls are not always plentiful, and when found not more than one in twenty contains beetles, which need not be greatly regretted by the collector if he is anything of an epicure.

Pityophagus verticalis Horn was described from a single specimen from Colorado, the absence in which of the small spinules on the external edge of the tibiæ seen in the other species was attributed to probable abrasion. From Mr. T. D. A. Cockerell I have received from Custer County, in the same State, an apparently perfect specimen in which there is no trace of these spinules. This character, when more specimens of this and *rufipennis* occur, may, apart from color, have chiefly to be depended on to separate the species, as from the specimens before me it is doubtful whether the cephalic characters will do it in all cases. In this specimen of *verticalis* the vertical fovea is rather an elongate impression with a fine line extending on the occiput. In three specimens of *rufipennis* from California the fine occipital line is absent in two and only discernible

in the third, but well marked in one from Oregon ; while in one specimen there is a very obvious frontal impression, much like that in this *verticalis*. In both species the head is transversely impressed posteriorly, and the pygidium concave with a much raised hind border.

Aphodius marginatus Lec. This fine species was described from a unique, and by Dr. Horn in his monograph, from the type and another specimen, both from eastern Nevada, and supposed to be females. Through the favor of Mr. Cockerell, who collects in Custer County, Col., at elevations of from 6,000 to 8,000 feet and upward, I have a specimen that appears to be a male. It differs from the type by having the front distinctly tri-tuberculate, and a fine basal thoracic marginal line evident at the middle, but obsolete near the sides ; the punctulation of the thorax and elytral intervals is exceedingly fine, and cannot be seen by the unaided eye ; there are large coarse punctures disposed in clusters along the sides and base of the thorax, but absent from a large triangular space on the disk with its apex posterior ; also a depression or concavity at the front as well as the hind angles.

Ligyrrus relictus Say. Walking on the river beach in August, I turned over a shingle on a small sandy place about which some grass was growing, under it were seven *Harpalus caliginosus*, and the elytra and other remains of several *L. relictus* which they had devoured. Noticing the sand to have been much disturbed I dug down and soon turned out twenty-seven of the beetles named, which were buried from two to four inches deep over an area of about ten by sixteen inches, and of both sexes. Other similar spots were investigated without results. Now is this a known and common habit? What is its purpose in the economy of the insect? Did the *Harpalus* kill those they feasted upon? *L. relictus*, also *Chalepus trachypygus* and an occasional *Polymæchus brevipes* come to the electric lights in the city, but *relictus* flies also by day in the warmest sunshine, especially along the river.

Leptura haematites Newm., *nana* Newm., *exigua* Newm., *saucia* Lec., *subargentata* Kirby, *similis* Kirby, *ruficeps* Lec., and *rhodopus* Lec. These names have long been a source of perplexity to collectors and of no little confusion. Dr. Horn (*Entomol. American* i., 8) recognizes only three species, *haematites*, *exigua* and *subargentata*, placing five others in synonymy—*nana* and *saucia* with *exigua*, and *rhodopus*, *ruficeps* and *similis* with *subargentata*. This leaves a very common species here and

northward through Canada without a name. *L. haematites*, with its red thorax, is well known, occurring abundantly on *Cratægus* and other blossoms in the spring. Its sexual differences consist in the thorax of the male being much longer than that of the female, and anteriorly narrowed. The unnamed species is similar in size (.18 to .22 inch in length), and has the same sexual characters, but the thorax and elytra are concolorous, being black, or brownish black, with cinereous pubescence. These two species are frequently taken together, and were the thorax of the same color could not be separated by any character yet discovered. I have the unnamed species from New York, Canada and elsewhere labelled *subargentata*, or *similis*, according to the color of the feet. *L. subargentata* is, however, a very different insect, though having the same sexual characters. It is much larger (.26 to .30 inch in length), blacker, more coarsely punctured and sparsely pubescent, occurring more commonly in northern Canada and the Rocky Mountain region to Mexico. In all these species the legs vary from black to rufous, and the colour is of no value. *L. exigua* does not belong to this group, having different sexual characters; the male has the last ventral segment convex at middle and impressed at tip, and in front of the impression a mucronate tubercle projected backwards; this, and the black spot on the thorax surrounded by golden pubescence, easily separate it (*L.* .24 inch). The unnamed species is probably in most collections by some name:

Leptura Zebra Oliv. July 6th. Several females taken ovipositing on a white oak stump made the preceding spring.

Agasphaerops nigra Horn. Among a number of Rhyncophora from Vancouver Island, B. C., from Rev. Geo. W. Taylor, there was a specimen of this singular insect, so like *Otiorhynchus sulcatus* that I passed it by as such till the unknown forms were examined. The genus and species were founded on two specimens taken at Mendocino, Cal. This specimen differs a little from the types being a little larger (.34 inch); the tubercles on the thorax are not very close, each being about the size of a No. 2 to 3 Klæger pin head, flattened on the top, and bearing a deep puncture; the elytral intervals are composed of single rows of tubercles equally as large and similarly punctured. On the thorax and elytra there is a pattern of white and golden scales similar to that seen in *Hormorus undulatus*, but they are sparser and less conspicuous; these scales are easily rubbed off, which may have been the case with the types before they were seen,

otherwise this might be regarded as a second species. The beak is sulcate like *Otiiorhynchus sulcatus*, but twice the length, and the scape of the antennæ scarcely reaches the eye. The elytral ornamentation of *sulcatus* is less noticeable and more pubescent like, and none of the tubercles of the thorax and elytra, which are much smaller, are perforate, those of the intervals being arranged in irregular clusters.

Conotrachelus naso Lec. I am not aware of a record of this species occurring in the Northern States. Last year and also the present I bred it from the fruit of *cratægus*—haws—as well as *C. posticatus*. The species are very close and are best separated by the two yellowish white spots on the thorax of *naso*. *C. cratægi* is, however, the great haw worm next to the larvæ of the Lepidopterous *Grapholitha prunivora* Mels., which develops with, but a couple of weeks later, than the beetles.

DESCRIPTION OF THE LARVA OF DATANA MAJOR G. & R.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Young larva.—Body dark reddish, inclining to black; otherwise as in the following stage.

Before last moult.—Body black or reddish black, with eight longitudinal clear white stripes, as broad as the intervening spaces or broader, with the exception of the dorsal space. Beneath are three partly obsolete white lines, two of them interrupted by the legs. The head and cervical shield all dark mahogany red, as are also the abdominal feet, the bases of the thoracic feet and two spots on segments 4, 5, 10 and 11. Thoracic feet black. The anal plates are black or dark mahogany red; sparsely distributed white hairs. Length about 30 m.m.

Mature larva.—Body black; stripes broken into a series of irregularly square or rectangular white spots. In the three upper rows on each side these spots occur two on each segment situated near the edges of the segment. The lower row consists of a spot before the spiracle, alternating with an elongated one overlapping on two segments, so that these spots nearly alternate with those of the upper rows. Head, cervical shield, anal plates, all feet (except thoracic) with their bases and two spots on segments 4, 5, 10 and 11, dark mahogany red. Below are a few white dots representing the usual stripes. Scattered whitish hairs. Length about 60 m.m.

There is a variety in which the stripes, and later the spots, are bright lemon yellow instead of white. The colour seems to be constant for an individual. The larvæ live together in rather small swarms, not exceeding fifty, till after the last moult, when they separate, often leaving the food-plant to ascend another in the vicinity. They then feed singly to maturity.

Food-plant, *Andromeda ligustrina*.

NOTES ON SOME CALIFORNIA MOTHS.

BY G. H. FRENCH, CARBONDALE, ILL.

Arctia Shastaensis Behrens, MS., nov. var. or nov. sp.

This new form was found by my friend, Mr. James Behrens, of San Francisco, at Upper Soda Springs, Siskiyou County, near Mount Shasta. The hind wings and abdomen are wanting, but the fore wings are present and in a very fair state of preservation. They are black, without light markings on the veins, but marked with yellow as follows:—A very broad transverse stripe, the basal of the usual three found in *A. Achaia* and *A. Behrii*, as wide as the female of *Behrii*, but more regular along its edges and curved more as this stripe is in *Achaia*, and not extending out on the costa as does this stripe in *Behrii*; the second of the three usual stripes is absent, save a few yellow scales on the sub-costal vein; the third is present, but narrow, arcuate, does not quite reach the costa, and only comes a little below the streak along median vein to posterior angle, a little attenuated at both ends; the usual longitudinal stripe below median vein, not reaching the base as this stripe does in both *Achaia* and *Behrii*, but beginning just inside the broad stripe, where it almost connects with an outward curved half line inside the broad stripe, that is broad on costa, but narrow below, outside the broad stripe the stripe is narrow, and on one wing broken before reaching posterior angle; the M-mark present much as in *Behrii*, beginning on costa midway between stripe three and apex, the first bar of the M curved inward, the other two outward and joined together and to the third stripe, the fourth bar absent as the spur that is usually sent out from the sub-median stripe is here absent. Fringes black; head, thorax and patagia black. Beneath as above, only paler. Legs black, except inside of anterior femora, which are yellowish.

The basal half line and fringes being black with the broad basal stripe would point to this insect being a variety of *A. Behrii*, as also the black body parts, but the downward curving of the sub-median stripe before reaching posterior angle ally it to *Achaia*; unlike either of these, it has no yellow along the posterior margin.

Apatela Felina Grote.

Mr. Grote describes this insect in vol. 5, No. 2, page 208, of the Government Survey Bulletins, comparing it with its ally, *A. Lepusculina*. Having several bred specimens, I make here a few additions to Mr. Grote's description.

The fore wings are distinctly blueish-gray, and the marks are more obliterate than in the usual *Lepusculina*. The female has scarcely a trace of the sub-terminal line, even in whitish shading; but one male has the sub-terminal line nearly as distinct as in *Lepusculina*, like that interspace ally arcuate, but bending inward only about half as far on the second median interspace, and consequently the line is not so far from the outer margin, below this vein as in *Lepusculina*. The psi mark is less distinct. Reniform obsolete, except a curved mark, part of the inner or basal portion of the annulus. One male has on one wing almost a perfect orbicular but faint. It is elliptical, the long diameter parallel with costa and much narrower than the same in *Lepusculina*. Hind wings of male white, soiled terminally and along the veins; of female so much soiled as to be gray. The fringes of both wings concolorous, checkered with black.

CANADIAN COLEOPTERA.

The Council of the Entomological Society of Ontario has decided upon rearranging the Society's collection of Coleoptera according to Henshaw's List. This will necessitate the entire reprinting of the "List of Canadian Coleoptera," and as it is desirable that the new list should be as full and as correct as possible, our friends will confer a great favour by forwarding to the Secretary a list of all new names of Canadian beetles that they may have obtained by correct identification. As it is necessary that the list should be placed in the hands of the printers with as little delay as possible, our readers are desired to reply to this request at once. Henshaw's numbers will be printed on the new list, which will be for sale in sets when completed.

MR. SMITH ON CERATHOSIA.

BY A. R. GROTE, A. M., BREMEN.

In reply to Mr. Smith's paper, somewhat inappropriately styled "*Arctiidae vs. Noctuidae*," I would state that my original paper in Entom. Amer. on *Cerathosia* had for its *main* object the pointing out of the errors contained in Mr. Smith's original description of the genus in the neururation. When these errors are corrected according to my statements (which latter in the main seem to be acknowledged by Mr. Smith as correct), the probability that the moth is an *Arctian* next to *Utetheisa* is weakened, and, as I have shown it is not a *Lithosian*, the chances are we must look for its position elsewhere. The *secondary* object of my paper was to suggest that we might find a better place for *Cerathosia* next to *Acopa*, etc., in the *Noctuidae*. Now, in reply to Mr. Moeschler, and Mr. Smith, I have to say, that I did not discuss vein 8 of *Cerathosia*. I have also to complain that Mr. Smith is an unfair writer, who indulges in large expressions of condemnation upon small grounds (as for instance the fact that some *Lithosians* have an accessory cell, while I give no accessory cell as a character of the sub-family), and above all a writer who misrepresents the party he desires to criticize. Mr. Smith alludes to a paper on *Cerathosia* "not yet reached." I advise him when that paper is reached, to have any statement it may contain as to the neururation of *Cerathosia* corrected according to my original corrections. I have no objections to my writings being "handled without gloves," as Prof. Fernald says Mr. Smith does, when the criticism is fair and reasonable.

A FINAL WORD ABOUT THE GENUS RILEYA.

BY WM. H. ASHMEAD.

In the last issue of the CAN. ENT. Mr. Howard, with a commendable solicitude for my entomological reputation, and under a heavy discharge of deadly parallel columns, seeks to evade the question at issue between us, *i. e.*, who has priority in the use of the generic term *Rileyia*; and notwithstanding the opportunity was afforded him to rechristen his interesting genus, he seems loath to do so, and again, by a misrepresentation, makes a claim of priority in publication.

Had Mr. Howard written *read* instead of "published," he would have been nearer the truth. However, this may have been another *lapsus*

pennæ. His published description first appeared in the October number of the CAN. ENT., nearly five months after the publication of "my synoptic tables," as previously pointed out by me, and the points claimed by him are without value.

In order to close a controversy that has already assumed an inconsistent warmth, I now propose for Mr. Howard's genus the name *Chrysoplatycerus*, and the species may in future be known as *Chrysoplatycerus splendens* Howard.

CORRESPONDENCE.

A FLOCK OF BUTTERFLIES.

Dear Sir: While in the interior of New Guinea, in Aug., 1883, I observed what might properly be called a flock of butterflies. They were apparently of one species* (of a dark brown color, with a blue reflection on the fore wings in a certain light), and in such great numbers as to actually blacken the green bushes on which they lit. I first came across them one day, while out after birds, in a thick and shaded part of the tall forest, in low land adjoining the Laloki river. Being so numerous, I supposed it would be an easy matter to catch all I desired without the aid of a net, but after several unsuccessful attempts, in which case they would rise in a cloud and settle again in a few moments on the bushes close at hand, I was obliged to give it up. They did not seem to be very much disturbed at my approach, but would not, however, allow me to get very near without taking flight. As soon as I remained still, they would immediately settle on bushes and foliage close by, but always out of reach. The flock was, perhaps, two acres in extent, but the butterflies were not equally numerous over this entire area. In some places every bush, branch, twig and leaf seemed to be covered with them, while in others there were comparatively few. What their object was, or how long they remained in that locality, I am unable to say, except that in visiting the place several days afterwards, they were still there in apparently undiminished numbers. I might add none were seen feeding, and, so far as I observed, there were no flowers in bloom anywhere in the vicinity.

S. W. DENTON, Wellesley, Mass.

* The name is unknown to me, but I have a specimen of this butterfly which, if returned, I will send to any person who is capable and willing to determine it.

ARZAMA OBLIQUATA.

Dear Sir : The recent communications of Mr. Brehme and Mr. Moffat (CAN. ENT. XX.—119, 130, 180, 238), have revived my interest in the habits of *Arzama Obliquata*, G. and R. At the Minneapolis meeting Entomological Club A. A. A. S. (1883), the habits of the insect were discussed at some length, principally by Dr. Riley and myself. So much of the discussion as the Secretary considered worth printing, may be found in Vol. xv. of the CAN. ENT., pp. 171 and 174. The only difference worth noticing between us was in regard to whether there are two broods annually or one. It was finally agreed that both were correct—quite unusual in matters of this kind ! In all probability, about Washington there are two, whilst in Western New York there is but one ; if this be so, some of the apparent discrepancies of your correspondents may be cleared up. Mr. Brehme describes the egg, and Dr. Riley the masses of eggs (xv.-171). It would be of interest if Mr. Brehme would communicate the manner of occurrence of the eggs. I have not been so fortunate as to find these bodies, but have followed the quite young larvæ to maturity. I feel sure that it is single brooded in New York and Canada, and that the mature larva in the fall swims to land if necessary (see xv.-174), and crawls into loose earth, or preferably into old wood, or under rubbish where it remains until spring, transforming in May. I have ransacked *Typha* stalks at all seasons for borers, and do not remember to have found this larva, nor have I any notes stating that it was ever found as larva late in autumn or in spring within the stalks, or that it was found to transform in the same. Whatever the habits may be in New Jersey, or at Washington, I have evidence which confirms the correctness of Mr. Moffat's impressions of the habits of the species in his latitude.

Dec. 17, 1888.

D. S. KELLCOTT, Columbus, Ohio.

PIERIS ILAIRE, GODT.

Dear Sir : I wish to record in your valuable journal the capture of *Pieris ilaire* Godt. at Lancaster, N. Y. The accidental occurrence of such southern forms at this northern locality has a certain interest which, I think, will warrant this notice. The present specimen was taken fluttering around a corn field on the 22nd of September, 1880. For about a

week previously warm southerly winds had prevailed with little or no rain, followed by a light frost on the morning of the 21st. At first sight of the butterfly I recognized it as a stranger to our neighbourhood, and with care succeeded in capturing it without further injury, if indeed such were possible, as it was already a woeful looking object, the wings were torn and badly denuded, and the poor creature hardly had the strength to support itself the few yards it attempted to fly. For eight years I have kept this sorry looking treasure hoping some day to learn its name and history, and in this I have at last been successful. Poey gives a good figure of the female in his *Centurie des Lepidopteres de l'Île de Cuba*, and it is well described by Boisduval in his *Species gen. des Lepidopteres*, vol. 1, p. 491. The present example is a large female with the black border of the wings unusually broad, which variation is mentioned by Boisduval. The most northern habitat that I can find is given in French's Butterflies of the Eastern United States, as "Indian River, Florida, Texas and Arizona," but I have had little opportunity for investigating the subject, and it may be a more common visitor in the north than I imagine. Prof. Grote, in his charming paper on the Geographical Distribution of the N. A. Lepidoptera, published in the eighteenth volume of this journal, has given us a very serviceable classification of the origin of the N. A. fauna. Probably *P. ilaire* pertains to the fourth table of his third category (p. 236), at least two of the species there enumerated appear to have been taken here, viz., *Thysania zenobia* and *Brotis vulneraria*. If, however, it breeds continuously in the Southern States, its association with *Erebus odora* in Grote's second table (p. 235) would seem more natural, and would render its occurrence here less surprising.

E. P. VAN DUZEE, Buffalo, N. Y.

The second paper on "Popular and Economic Entomology," which was promised for this number, has been prepared by Mr. Fletcher, but owing to the cuts required for its illustration being in the hands of the printers of the Annual Report at Toronto, it has been found necessary at the last moment to defer it till next month.

Mailed February 9th.

The Canadian Entomologist.

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No. 3.

DESCRIPTION OF THE PREPARATORY STAGES OF COLIAS MEADII, EDWARDS.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG.—Fusiform, thick in the middle, tapering to a small rounded summit, the base small, flat; ribbed longitudinally after the manner of the genus; colour yellow-green. Duration of this stage four to five days.

YOUNG LARVA.—Length, at 24 hours from egg, .06 inch; cylindrical, even; colour brown-green; thickly covered with black points, from each of which a short fine hair; head rounded, blackish-brown. Duration of this stage five days.

After First Moulting.—Length at 12 hours .11 inch; colour dull brown-green; the ridges thickly set with black points, each with short grey hair; head brown-yellow. To next moult six days.

After Second Moulting.—Length at 12 hours .16 inch; colour dark green, covered with yellow points so thickly as to give a yellow hue to the whole surface, each point with hair; a mid-dorsal dark stripe; a faint indication of a yellow sub-dorsal line; so also of a basal stripe; head green-brown with many fine tubercles and hairs. To next moult about six days.

After Third Moulting.—Length at 12 hours .22 inch; along the under-side of the indistinct sub-dorsal yellow line is an ill-defined row of black spots, one to each segment from 3 to 11; the basal ridge yellowish, but not yet showing a clear band. Later in the stage the black spots show clearly, those on 3 and 4 largest, the rest diminishing regularly to a very small one on 11; head as before. To next moult five to seven days.

After Fourth Moulting.—Length at 6 hours .46 inch; at 24 hours .52 inch.

MATURE LARVA.—Length .7 inch; cylindrical; nearly even; on the flattened ridges are many points, each giving a short black hair; colour

dark yellow-green, the effect of the black hairs being to make the body darker than in most species of the genus ; a pale yellow narrow sub-dorsal stripe, under which from 2 or 3 to 12 is a black spot on each segment, the anterior ones largest, the others gradually lessening in size to the last ; along base a narrow white stripe ; under side, feet and pro-legs green ; head rounded, a little depressed at top ; colour green, lighter than body, much covered with black tubercles with black hairs. From fourth moult to pupation five days.

CHRYSLIS.—Length .66 inch ; breadth across mesonotum .16 inch, across abdomen .18 inch ; greatest depth .22 inch ; shape of the genus ; compressed laterally, the thorax on ventral side prominent ; head case pointed, beak-like, the projection less prolonged than in some or most species observed ; mesonotum rounded, carinated, the sides sloping, a little convex ; followed by a shallow depression ; abdomen conical ; colour green-yellow, all the ventral side being brighter than the dorsal, and the projection at head quite yellow ; a mid-dorsal darker line, and a faint sub-dorsal line ; all the dorsal side and the ventral of abdomen dotted and mottled whitish, the wing cases and ventral side to head finely granulated. Duration of this stage, in the only case where the butterfly appeared the same season in which the egg was laid, six days.

This alpine species is found in the Rocky Mountains, in Colorado, and probable throughout the range to British America. Certainly it is if *Elis*, Strecker, is synonymous with it, as I believe to be the case. Mr. Mead first took this *Colias* on top of the "divide" between the Platte and Arkansas valleys, about 12,000 feet elevation, and says he took none lower than at 10,000 feet. Mr. Bruce says the proper habitat is from 11,000 to 12,000 feet, though, when the butterflies get into the narrow canons, they will follow the track down to 9,000 feet at least, and mentions (CAN. ENT., xix., 228) having taken several at Webster, at 9,000.

I received a number of young larvæ, 23rd July, 1888, from Mr. W. S. Foster, at Salida, Col., which had hatched en route. The female was taken on Marshall Peak, 11,000 feet, 15th July, and confined over *Astragalus*. One of these larvæ passed first moult 27th July, the third moult 9th August (the second not observed), the fourth moult 14th August, pupated on 19th, and a female imago came forth 25th August. But the other larvæ, by 28th August, were in lethargy, and soon after

were sent to Clifton Springs, New York, to go in the refrigerating house, and there they are at this writing.

I had previously had eggs of the species from Mr. David Bruce, 25th July, 1886, laid on 21st and 22nd July, and which hatched 26th. On 31st July several of the larvæ passed first moult; on 6th August began to pass second; on 15th, the third. None of these went to pupæ, but all were asleep early in September, and were sent to New York, but were dead when I received them the following March.

The egg and pupa are like the same stages of *Philodice* in shape; the larva is darker than any *Colias* I know of, and there is no red in the basal stripe. The sub-dorsal line is not very distinct, but its place is indicated by the row of black spots next it on lower side.

I had no difficulty in rearing these larvæ on white clover, but at same time, in 1888, could not induce larvæ of *C. Scudderii* to eat clover or any other plant, and all died. The same was the case with *C. interior*. Mr. Fletcher and Mr. Scudder both also found it impossible to get larvæ of *interior* to eat of any plant, though they offered everything any *Colias* is known to eat that was procurable. These two larvæ are the only *Colias* known to me that will not freely eat white clover or else *Amorpha*.

COLIAS CÆSONIA, STOLL.

BY JEROME M'NEILL, MOLINE, ILL.

Somewhat to my surprise I found this species not uncommon here during the collecting season of 1887. Although my entomological interest lies in another direction, and I have, consequently, made no special effort to obtain Lepidoptera, I find I have ten specimens of this striking *Colias* in my collection, all of which I have taken during the summer and fall of 1887. On looking over the collection I discover that these specimens were taken at three different times. One—a very much worn specimen, with one hind wing gone—was captured the sixth of June, on Rock Island; six specimens were taken on the twenty-third of July in an upland clover field, two miles south-west of Moline. They are all fresh and bright, and were found in company with *C. philodice*, *Papilio chresphontes*, *P. turnus* and *Danaïs archippus*. The last three were taken September the sixteenth, in a low-lying field, on the banks of the Mississippi, three miles

east of Moline. These specimens are, if possible, fresher than those taken July twenty-third. This species would, therefore, seem to be three brooded in this latitude. There are also certain marked differences in coloration, which may or may not be distinguishing characteristics of seasonal varieties. The spring form, as it is represented by the single specimen referred to, is distinguished by the absence of any indication of the sub-marginal row of spots or points on the underside of the wings or any trace of orange, except the two spots on the upper surface of the hind wings; the rose pink ray extending outwards from the body on the hind wings is present. The summer form, as it is represented by the six individuals in my collection, is marked as follows:—The sub-marginal row of spots on the under surface of the wings are none of them pink; those in the interspaces of the first and second, and second and third ediman veinlets, being black, the others brown; the pink stripe on the under side of the hind wings is entirely wanting, and there is on the upper surface of the hind wings a sub-marginal area of orange, bright or faint, which sometimes extends from the marginal black band nearly to the orange discal spot. There is also in all of these specimens a clearly defined oblong raised patch of scales of peculiar form extending along the upper side of the sub-costal vein of the hind wing, from the costal vein to the branching of the first sub-costal veinlet. These scales seem to stand on end, and although I have not satisfied myself of the fact, I think it is probably that these scale-like bodies, are excrescences on the true scales. This patch of scales seems to be confined to the males. It varies in colour from yellow to reddish-orange. When it is yellow it is concolorous with the adjacent surface, and not conspicuous, although the raised margin of the outer edge is always very distinct on a closer examination. In the single specimen of mine in which this area is reddish-orange, it is scarcely less conspicuous than the "dog's head" when the anterior wings are pulled forward far enough to expose it. Since it is present in all the males and absent in all the females I have collected, I take for granted it is a sexual mark. If this character has been described before, I have no knowledge of the description, though it seems strange that it should have been overlooked. Its presence would support Mr. Strecker and others in removing the species from *Colias*. In the fall form, as represented by the three specimens taken September sixteenth, the brown spots on the under sides of the wings are replaced by pink; the two black spots between the first and second, and second and third median veinlets, remaining unchanged; the

pink stripe on the under side of the hind wings is prominent, and both pairs of wings are margined with a narrow stripe, in some places a mere line of pink extending on the primaries from near the base along the costal and outer margins to the anal angle, and on the secondaries along the anterior and outer margins to the anal angle. On the upper side of the hind wings the distribution of orange is very similar to that in the summer form, but the marginal band of black, which in the latter is comparatively broad and dentated within in the fall form, is narrow and interrupted by the veinlets, so that it is really composed of a series of spots, sub-triangular in shape, with the apex acute and sometimes prolonged into a narrow line which extends into the orange as much as three-sixteenths of an inch. The coloration of the female of this series is so remarkable that it seems to deserve a name, as apparently a dimorphic or at least an aberrant form, and I propose that it be called *rosa*, if it should be found to be a constant variation. The upper surface of the primaries does not differ essentially from the type. The whole upper surface of the secondaries is powdered with brownish-black and orange scales. The black scales are more thickly clustered between the discal orange spot, which is partially obscured by them, and the outer margin. This very much broadened band only partially and unequally obscures the yellow ground colour so that it includes within it a sub-marginal row of large, round, yellow spots, about four in number. The under side of the primaries have the "bright yellow" of the apical portion replaced by bright, deep-rose pink. The under sides of the secondaries are completely suffused with pink, the greenish-yellow scales of the ground colour being partially exposed only along the veins and veinlets. The silvered "pupils" are all that remain of the discal spot and its accompanying spot without the cell. The pink of the under surface is so prevalent that when the butterfly is at rest no other colour is visible, and it looks like a pink blossom. My attention was first called to it by seeing a large *Colias* a few yards in front of me disappear just when I expected to see it at rest on a clover head, as it would fly up at intervals I followed hoping to catch it resting but always puzzled to see it apparently dive head first into the clover. At last, growing impatient, I attempted to "force the fighting," and although I missed my game I so disturbed its flight that I caught a glimpse for the first time of the pink under surface. I was now thoroughly interested and I employed all my arts in vain to decoy or force the wary butterfly into my net. In a few minutes after I had given up the pursuit I caught

in the same field the same butterfly, or more probably, considering the ease with which the capture was made, another similarly coloured. As soon as I had assured myself that the specimen was as pink as I had supposed, I promised myself three or four, remembering that I had seen two within half an hour, but although there were hundreds of *philodice* I saw no more *cæsonia* that day, and more pressing business prevented me from returning to the locality as I had hoped.

ON THE CITATION OF LOCALITIES.

BY T. D. A. COCKERELL, WEST CLIFF, CUSTER CO., COL.

It is the custom nowadays to look down with great contempt on those old authorities, who considered "North America," or even "America," a sufficiently accurate locality to give when describing a species; but, perhaps, we of the present age are not quite blameless of similar and (with our means of obtaining information) less excusable carelessness in, that we often think it enough to give the name of the state or region only. Of late, I have been going carefully through as much of the literature of North American Entomology as I could get a sight of out here in the wilderness, in order to catalogue the recorded Colorado insects for the Colorado Biological Association, and I have been astonished at the number of new species described with the localities given indefinitely, "Colorado," "Texas," and so on. Taking eighty-four species of moths at random, mostly new, and recorded from Colorado of late years, I find only twenty-six have the locality indicated nearer than "Colorado"—and I think this is a very fair sample of the whole. Now, do these describers of species ever stop to consider what "Colorado" may mean? That it may refer to any altitude from below 4,000 to over 14,000 feet, and to anywhere in an area of no less than 103,948 square miles? That "Colorado" may mean snowy peaks, mountain forests or valleys, or level treeless plains, each presenting a distinct fauna of its own? Perhaps they do not stop to consider these points, possibly they do not care, so long as the species has been properly classified and named, and is henceforth recognizable in the cabinet. Well, we cannot all be systematic entomologists, students of geographical distribution, biologists and the rest, but, surely we may be precise in touching on departments not our own, and, if we are giving localities, there is no reason why they should not be sufficiently accurate

and detailed to be useful. It may, perhaps, be answered that most of the species are not collected by the writers themselves, and the collectors sent no exact localities. Probably not, but were they asked for them? Collectors will supply proper localities, and often very interesting details if they are given to understand that these are wanted—as is plainly evident from the fact, that some few careful authors always manage to know where their species come from, and a good deal about them besides.

My own idea in the matter is, that every description of new species ought, if possible, to have the collector's own notes appended thereto, so that we might have some idea of what the *living* insect was like, and not only have an account of its dried remains impaled on a pin. Fancy, if someone undertook to write an account of the human race, founded entirely upon information obtained in the post-mortem room and anatomical museums! But, if we cannot have biological notes, let us at least have localities—they can be got when they are wanted, and indeed, I have known some instances in which names of localities have been duly sent in, but never mentioned by the describing author.

Sometimes authors take it for granted that because they write from a certain place, it will be understood that the species were captured there, but I could easily demonstrate that such an assumption, in all cases in which the locality is not given, would lead us into quite ridiculous errors, and this being so, how are we to discriminate? One usually precise author, who has described a very large number of new species of late years, has given for most of them only the name of the state in which he resides, and for many no locality at all. Now, according to Packard, this state embraces two distinct Zoö-geographical regions, so it becomes of especial importance to know exactly where the insects in question came from. So I wrote to this author, expostulating with him on this point, and he replied that he quite agreed with me that localities should be properly defined, and all the species I alluded to were to be understood to come from the vicinity of the town in which he resided. Now, this is excellent, provided that the lacking or indefinite localities *are* so understood; but on the face of it, until I had this information from the author, this fact was not always evident. Perhaps it has been stated somewhere in his writings; but this hardly better matters for the student, who naturally takes one paper at a time, and considers it on its own merits, unless referred back to previous remarks bearing upon it.

Fortunately, there are some systematists who do appreciate the value

of precision in localities, and I was pleasantly surprised a short time ago at receiving the following from a well-known naturalist, to whom I had sent a list of mammalia, with their distribution given by counties:—"I hope you keep the exact localities as well as the counties. Most of the counties in Colorado are so large that they include great variations in altitude and physiographic conditions, and hence embrace widely different faunal characteristics." With this quotation I close the subject, commending it to all describers of Colorado and other insects, and drawing their attention to the fact, that after all it expresses the views of all really competent Vertebrate Zoölogists, Conchologists, and Botanists, and hoping that in the future they also will give proper attention to the citation of localities.

One other matter may deserve a passing notice—that of giving credit to collectors. I have nothing to complain of under this head myself, and so can speak more freely. It seems to me, that a systematist who receives specimens from a collector, who, we may assume, has gone to considerable trouble to collect them, and fails to credit him with the captures when describing, does about as discourteous a thing as is possible in Entomological literature. It would be very easy to show that from a scientific point of view, it is always useful to know who collected the specimens in question, and at the risk of being called egotistical, I do not mind saying that I desire and expect that new species I may have collected shall be duly credited to me in publication, and I am sure all other collectors must feel the same. I do not wish to be personal, but very many quite recent cases, in which no collector's name has been given, will occur to everyone*—I need not enumerate them. Some authors seem to think that if they have obtained specimens from professional collectors, they are then, at anyrate, at liberty to omit the collector's name. It seems to me that they are, if anything, under increased obligation to give it. Fancy what an author would say if the editor of a magazine refused to publish his name to an article because he had paid for it! This matter of crediting collectors† is, I think, a serious one, but collectors can easily put it right if they will make a point of only sending specimens to those who will give them credit.

* In some of these cases, however, the authors are probably blameless. It is not always possible to ascertain who was the collector.

† One kind of "crediting," however, I do think unwise. If Tompkinson discovers a new insect, I cannot myself see that that is any reason why the poor creature should ever after be burdened with the name "*Tompkinsoni*" !!

LENGTH OF LIFE IN BUTTERFLIES.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Aurelians are frequently asked how long butterflies live. By this is generally meant what is the length of life of the mature insect. As is generally known, each species passes through one cycle of its existence once a year, though it very frequently happens that two, three, or even more generations succeed one another during a single season, and it has been supposed (though never proven) to be the case with some that two or more years are required for this cycle ; as is known to be true of some other insects. But with regard to the length of life of the butterfly itself, there is not a little variety ; when the disappearance of a given butterfly is in consequence of the approaching cold season it may well be and often is the case that the butterfly has merely gone into winter quarters to appear again on the wing the ensuing spring. In cases like these, the duration of life of a butterfly may be as long as eight or nine months or even more, for there are hibernating butterflies which emerge from the chrysalis by the beginning of August or even in July, but which do not go into winter quarters until September, October or even November, then appear again the next season as soon as advancing spring has begun to make itself felt, and continue upon the wing sometimes through June, sometimes even into July. It is impossible to say certainly whether or not the individuals flying latest in the spring number among them any which were earliest to escape from the chrysalis in the preceding season. But setting aside the chances of capture by their enemies, there is no reason to believe it impossible, and that they may spend and probably in many instances do spend fully ten months of the year in the winged condition.

This conclusion may be reached also in another way. We may add together the ordinary life period of the egg, the time it takes the caterpillar to reach maturity, and the period of the chrysalis, and in these hibernating butterflies we shall rarely find that these stages together occupy on the average more than two months. The remaining ten months must therefore be the average time spent upon the wing. That many may live eleven months or even twelve seems probable, for a butterfly may continue to fly for some time after the first eggs are laid, especially in the case of those which lay but one at a time, where the eggs do not develop in the

ovaries at once, but slowly and by degrees, and so are deposited in succession over a considerable period of time.

In an article in the CAN. ENT. (xiii., 205-214) on this subject, Mr. W. H. Edwards has laboured to show that eggs are almost invariably laid by butterflies fresh from the chrysalis, and that the butterfly dies soon after the laying of the eggs. This proves quite too much, for if it were so, a butterfly would hardly fly more than a week. That eggs are often laid by butterflies soon after eclosion from the chrysalis is doubtless true, but there are quite as many cases where egg laying is delayed for a considerable length of time,—two, three or four weeks; an examination of the ovaries of butterflies will show that it is rarely the case that all the eggs are laid even within two or three days of each other, but that they mature by degrees too slowly for such rapid oviposition. There are of course some, in which the eggs are laid in masses, when a greater number are laid in a single day, but the cases are far more numerous when egg laying is continued over many days, and sometimes probably over several weeks.

It is possible that the duration of the life of butterflies is greater in the north than in the south. As one approaches the tropics, insectivorous birds and other creatures are far more destructive of butterfly life than with us, and the chance of long life upon the wing must be greatly lessened with the numerous liabilities to disaster which overtake the poor butterfly in the warmer regions. There may even be a difference in this respect between districts so near each other as West Virginia and New England. For certainly my own experience of the overlapping of broods of different butterflies as seen by me in New England is very different from that reported by Mr. Edwards in West Virginia, and inasmuch as these broods follow each other with greater rapidity in Virginia than with us, the difference is thereby exaggerated.

To judge from the statistics that I have collected from observations made in the field both by myself and numerous correspondents, I am inclined to think that, in the case of those butterflies which are born and die the same season, the average length of life of the mass of them, that is, omitting mention of those which, cut off early, come to an untimely end, to be not far from four or five weeks, varying in different species from three to six or seven. Of course it is impossible to arrive at any very accurate determination regarding this, since in the case of any particular species we are obliged to base our conclusions on observations of

the times when the earliest butterflies were seen, when they became most abundant, when the numbers perceptibly diminished, or specimens became old and worn, and when the last were seen. It is particularly difficult to decide upon the average age of individuals, when, as is not infrequently the case, a brood of butterflies is augmented by gradual accretions for a long period of time, three, four or five weeks. It is again difficult in the case of those butterflies, and there are not a few of them, like some of our *Argynnidi*, which appear upon the wing in mid-summer, receive a sudden accession to their numbers a month or two after the advent of the earliest and then only begin to lay their eggs. I, for one, can hardly believe that all these earliest individuals perish before the season for egg laying, and I even think from the condition of specimens, worse and worse as the season progresses, that some of the earliest live to the last and are upon the wing sometimes for two and three months of the year.

ON SPECIFIC NAMES.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Dr. Williston, in his painstaking work on the *Syrphidæ*, says: "There are no generic and specific limitations in nature," and illustrates the statement by the present knowledge of the family with which his synopsis deals. And what Dr. Williston brings forward is a mere quota of the mass of evidence brought out by naturalists generally, and by entomologists dealing with the different orders of insects. But while, theoretically, the essential unity of living forms or of nature as a whole may be granted, the practical question of what names we shall bestow upon our specimens and upon what basis these names shall repose, must be solved. Our systems of nomenclature must be brought into consonance with the facts observed. And it is well that our nomenclature be not too rigorous, so that I have expressed the opinion in these pages that we shall have to use in certain cases a trinomial title. With regard to the test for genera in the moths, I have to refer for my conclusions to a paper in *Papilio*, 3, 35, where I say that the *amount* and *extent* of the peculiarity gives the criterion, not the *kind*. Every well-marked variation and modification of structure, which can be clearly made out by the microscope or otherwise, is of generic value. The moment this rule is departed from, we are thrown upon individual "opinions." All the characters which, when well-marked, are of generic importance, are liable to slighter modi-

fications, which are only specific. It is the *kind, constancy* or *amount* of these modifications which must decide the class in our artificial divisions of these natural objects. And here the tact of the specialist, of which Dr. Williston also speaks, comes into play. With regard to the criterion for species, I have expressed myself already clearly in these pages, so far as the Lepidoptera are concerned. For the student of butterflies and moths, the criterion for species must lie in a knowledge of the whole life of the insect. If it breeds true to type, nowhere encroaching upon the cycle of its neighbour, we must bestow a specific title. The insect is today a species, whatever its ancestry, whatever its probable future development. The fact, from our experience, may be assumed without a knowledge of the larva and natural history, but *until* this knowledge is also added to our observations on the perfect insect, the specific title is not firmly or conclusively founded. This is what I meant to say with regard to the forms of *Callimorpha*. Now in separating the forms of *Datana*, we had alcoholic specimens of the larva and the personal observations of Mr. Angus to fall back upon, for most of the species. And the fact with these moths that in the earliest stages the species are not distinguishable on sight, has been shown by Mr. Wm. H. Edwards to be true with nearly related butterflies, as for instance species of *Colias*. While breeding has revealed to us a number of questions, such as dimorphism, which we must take into consideration, I must still renew my protest against *lumping* upon grounds drawn from the perfect insect alone and upon insufficient evidence. The new facts lead us insensibly to criticize species, to conceive a prejudice against them, and then to lump without sufficient evidence. And I repeat, that as Entomologists we are here to discriminate, to separate, not to confound. Butterflies were by the ancient Hebrews classed among "flying things." From this primitive conception of their place in animated nature, we have gradually come to-day into nearer definitions of their relationship.

In the discussion of all these questions there can be no progress without reasonableness. Temper and even position will not ultimately decide these questions, although the melancholy conclusion of Spinoza is here not without its truth: "*unusquisque tantum juris habet, quantum potentia valet.*" The appeal to time need not always have to be made. A great deal of what is wrong and one-sided need not afflict us, as Entomologists, if we would only take matters coolly, or only grow warm over the beauties of our treasures.

DR. CHRISTIAN ZIMMERMANN.

BY H. A. HAGEN, CAMBRIDGE, MASS.

There exists no biography nor necrology of this excellent entomologist, as far as known to me, though he lived for thirty-nine years in the United States. I am much indebted to Dr. Geo. C. Horn for Zimmermann's note-book, which, with his library, came into the hands of the late Dr. J. L. Leconte.

Only a very short abstract of the contents, which are written wholly in German, can be given. The entries begin with Zimmermann's earliest boyhood and end in 1843, followed by a few pages for 1865. The narrow pages contain only the substances of events in short phrases, often very cutting, both for Europe and for America. If the whole could be published, it would give a very interesting picture of the life of an excellent naturalist, always kept down and hindered by want and ill-luck, but always ready to "begin again." It is sad that such a life, akin to the remarkable histories of former ages published by the masterhand of G. Freytag, should have been possible in the 19th century—a continuous struggle of a noble soul with continuous misfortune.

Christian Zimmermann was born in Quedlinburg, Prussia, September 6, 1800. His father and three generations before him were carpenters, as the name indicates; all were born and died in Quedlinburg. Christian entered the gymnasium in 1811, and graduated in 1821. The note-book, May 26, 1814, says: "I am to-day 5000 days old." (He always counts his life, both in Europe and here, by the 1000 days.) The collection of beetles begins, and the study of music. His talent for music must have been obvious, as one year later he played the organ for the church-service, and studied thorough bass. When he graduated he writes: "Up to this time my money was made by keeping score for target-shooting, teaching children, giving music-lessons, organ-playing, copying music, furnishing music at funerals, stuffing birds."

His parents, who were poor, proposed that he should choose a profession; but determined to study, he went to Halle, where he stayed as student from 1821 to 1825. He passed his examination after having attended the lectures in theology, philology and philosophy, but his entomological studies were never neglected.

In 1827 he published his first music, a Polonaise. When he left Halle in 1828, he was already acquainted with a large number of eminent

zoologists. He went to Berlin, and writes : "Great expectations, small success, a load of cares, experience of the world." He worked with Prof. Klug in the Museum, and gave Latin lessons to barbers' apprentices. March, 1829, working up the genus *Amara*, of which some sheets were printed. 1830, very bad times begin ; want of money. 1831, monograph of the genus *Zabrus* finished ; printed in June.

During this time he had become acquainted with many prominent entomologists and with a large number of students, who later became famous, but the constant want of means was so depressing that he decided to try his fortune as a collector in Mexico. He sold his collection of 2,400 species of beetles and his books. To enable him to fulfil his intentions, twenty-four naturalists of prominence from Germany, England and Russia subscribed six hundred dollars, and a number of friends six hundred and eighty dollars to pay his debts. This was all repaid with interest by Zimmermann, as soon as he had made money here, as a page in his notebook states. He left Hamburg, Aug. 5, 1832, as steerage passenger for Philadelphia. He began directly to collect, and to study the English language. His collection grew rapidly, but in a few months he saw that it was impossible to work in expensive America for cheap Europe without running in debt. So he decided to leave Philadelphia and to try his luck as a teacher in South Carolina. He made the trip, according to the custom of German students, on foot, a knapsack on his shoulders and a few dollars in his pocket. This journey of 713 miles, in the midst of a severe winter, and attended with much hardship, which proves his excellent health and strength, was made in fifty days, with twenty-seven dollars in cash, six dollars credit, three maps, one book and a pocket-knife. The visit to Dr. Melsheimer on this trip has been published before by me. The detailed report of excursion given by Zimmermann to Prof. Burmeister is very interesting, but has never been printed. Zimmermann had no idea that he was here considered simply a tramp, which explains easily and rightly most of his complaints.

In Georgetown, S. C., he tuned pianos and gave music-lessons till he was engaged in the South Carolina Female Institute, at Berhamville, to teach music and drawing. This happy change in his circumstances allowed him to pay directly the debts made in Europe, with five per cent. interest. He collected largely ; sometimes quoting the number collected at the end of the month or the year, as : "11,508 specimens have been

collected," besides mentioning any remarkable forms. He made many excursions, visited Cambridge (where he saw Harris), Niagara, Albany, the Catskills, New York and its surroundings. He made the acquaintance of every naturalist of eminence. He sent to Europe many insects and received many from there, together with the newest publications. His correspondence was apparently a large one.

After a few years his situation in the school where he was engaged was given up; it had become unpleasant sometime before. He possessed now an excellent collection, very comfortable furniture and three thousand dollars, and decided to buy a little farm to be used as a nursery and for raising silk-worms. In 1839 he made, as he states, fourteen "farm reisen" in Philadelphia, Maryland and other states, partly with Ziegler and Morris. His project proved to be a failure, and he decided to return to Europe and to send his property to New York. After a short visit to Harris, he went to New York to find that the vessel with all his property was lost in a fearful storm. His note-book says: "Sept. 10, I am notified of the loss of my collection and property." "Sept. 16, beginning of a new collection; the voyage is given up." "Sept. 25, invitation of Harris to come to Cambridge," where he stayed until November 12. On Nov. 7th new insect-boxes were bought of the box-maker, Newell, in Cambridge. He made many excursions with Harris, whose family very well remember the German naturalist.

The next year he lived in Baltimore, occupied with entomological systems and excursions with Mr. Morris, and decided to return to South Carolina. Feb. 27, records a "letter to Hannah, with an offer of marriage." March 21, "Hannah answers 'yes.'" April 3, "I find *Horia sanguinipennis*." April 14, "I find *Trichius maculosus*."

He had made the acquaintance of Mrs. Hannah Green, afterwards his wife, seven years ago in Georgetown, S. C. We find in his note-book, "Evening with Hannah; drawings on the wall; Sweet Home and picture; quarrels plenty." Monday, June 21, "Arrival at Rockingham, N. C." June 22, "I reach the town in the morning, visit Hannah at noon, and am married in the evening."

"Hannah begins her school, July 16, with sixteen pupils, and seven pupils of mine in music and drawing."

"Sept. 17, dispute took place with Hannah about American culture,

and the fight that lately happened in Washington among the members of Congress."

It very soon became apparent that it was impossible to make a comfortable living in North Carolina, and they decided to return to Columbia, S. C. Here they built a school-house, forty feet by sixteen, which was inaugurated December 18, 1843. The expense was, for the building, \$417; for Loring's globes, \$33. Income during the year, \$1,521; expenses, \$1,277.

This is the last entry in the diary, and I know nothing more of his life except what is told in some letters to Thaddeus W. Harris. Some extracts follow: "1865, January 1, I possess \$570 in Confederate money; \$200 in Confederate bonds; \$900 in certificates; \$200 in provision store shares; \$13 in bank notes; \$114 in silver. Feb. 10, the Yankees are in Barnwell Co. To-day's prices—A load of oak wood, \$140; a barrel of flour, \$550; a pound of brown sugar, \$12; a bushel of corn, \$35. Feb. 17, the Yankees are here, 75,000 strong. This is the last day of Columbia. They at once entered the houses, got drunk and set fire to everything. I began to move everything that could be moved into the garden; but they broke open the trunks and boxes with their swords, and followed this up with a regular and general plunder. Feb. 22, the Army has left. All quiet. My collection and books brought back in the house. Expenses for this day—1 bushel meal, \$40; 13 lbs. beef, \$22; molasses, \$6. July 1, we still possess \$1,100 Confederate State bonds, worth nothing; \$915 Confederate treasury notes, worth nothing; \$13 South Carolina bank bills, worth — (?); \$3 South Carolina state bills, worth — (?); silver money, \$74; gold, \$2.50; copper, 5c. We must begin again at the beginning."

This is the closing sentence. These few, simple words, without any moan over the loss of his all, are not a little touching, all the more so, because the pathos is unintentional—the pathos of facts, not of words. They call to mind his former record of the loss of everything by shipwreck on the 10th September, 1839, followed by the entry on Sept. 16th, "Beginning of a new collection."

Zimmermann died in December, 1867. He left no children.

His interest in science was always kept up. Nearly every month the number of insects collected is reported, sometimes amounting to 3,725, and during the year to 11,500. In November, 1842, he sent fifty dollars to T. W. Harris, to buy three Goliaths. He constantly bought books both in Europe and America, and his library was valuable. It was bought

by the Museum of Harvard College, in Cambridge, excepting some volumes which were retained for his own use by Dr. J. L. Leconte, at whose instance the purchase was made.

His collection is also in the Museum, having been bought first by Dr. Lewis, of Philadelphia, and from him by the late R. Crotch, who sold it to the Museum. A great part is in Leconte's collection, and can be recognized at once by the numbers on the pins in Zimmermann's hand-writing.

He was an unwearied worker. In 1842, he wrote to Harris that he was occupied with a systematic arrangement of the Lamellicorns, and wanted *Echiurus* and *Goliath* for study. In April, 1844, he writes again to Harris: "I have almost finished my chapter on Lamellicorns."

(To be Continued.)

NOTES FOR COLLECTORS VISITING THE PRAIRIES AND ROCKY MOUNTAINS.

BY GAMBLE GEDDES, TORONTO.

Now that the winter is well advanced and before many weeks are over spring will be upon us, it reminds me of many enquiries made during the last few years about the localities and dates of diurnals captured by me in the North-west in 1883 and 1884. These particulars are nearly all to be found at the National Museum of the Geological Museum at Ottawa, but for the benefit of those who may be visiting the North-west with a view to collecting diurnals, I propose to give such information about the rarest species as my notes supply, and as my limited time will permit.

Beginning with June 10th, 1883, at Brandon, N. W. T., I find *Phyciodes carlota* Reak. was taken, and *Lycæna afra* W. H. Ed.

June 12th, Fort Ellis.—*Erebia epipsodea* Butl. was in beautiful condition.

June 15th, Medicine Hat.—*Colias Scudderii* ♀ and *Colias christina* ♂, *Cænonympha inornata*.

June 29th.—*C. christina* ♂ plentiful, *C. Astræa* ♀ (?) one specimen or two.

June 30th, Calgary.—*Chionobas varuna*, *Satyrus* var. *boopis*, *Lycæna afra*, *L. anna*, *L. amyntula*, *L. rustica*, *L. sæpiolus*, *C. ochracea* and *inornata*; of *Colias* four varieties, viz.: *C. Edwardsii*, *C. Scudderii*,

C. alexandra and *C. christina*; *Anthocharis olympia*, *A. ausonides*, about the swamps; *Argynnis nevadensis*, *A. artonis*, *A. Edwardsii*, *A. bellona*; *Phyciodes carlota*, *P. tharos*; *Chrysophanus epixanthe*, *C. helloides*, *Pamphila Manitoba*, *Zabulon. Cernes*, *Manataaqua*. Not a bad day's work for the last day of June.

July 8th, Edmonton.—*Arg. lais* and *cybele*, *Lim. arthemis*, *L. disippus*, *Lyc. anna*. No *Colias* or *Pieris* seen to-day.

July 23rd, Fort Macleod.—*Arg. leto* ♀ and *Chrys. sirius*.

July 25th to 30th, Pincher Creek.—*Arg. elio* and *eurynome* taken; *Arg. artonis*; *Pieris occidentalis*.

July 30th.—First specimens of *Parnassius smintheus*, *Chrysophanus Florus*, *Col. Scudderii* ♀ pale green. Several taken.

Aug. 1st.—*Thecla mopsus*, *T. titus*.

Aug. 2nd, Garnett Rancho, mouth of Crow Nest Pass.—*Colias Hagenii*.

Aug. 3rd.—*Par. smintheus*. Very common, both sexes.

Aug. 5th.—*Satyrus charon*, and *Sat. sylvestris*, and *Arg. leto*.

Aug. 6th.—*Arg. boisduvallii*, *Limenitis lorquini*, *Chrys. mariposa*, *Mel. pallas*, *Mel. nubigena*.

Aug. 8th.—*Arg. monticola*, *Pieris oleracea*.

Aug. 15th, Belly River.—*Col. Hagenii*; dwarfed in size, and every shade from albino to orange.

In 1884 I started much later, leaving Toronto 26th June.

June 30th.—Saw one ♀ *Colias christina*, first day out west from Winnipeg.

July 1st, Swift Current.—*Chrysophanus dione*, *Arg. Edwardsii*, *A. Nevadensis*, *Euptoieta claudia*.

July 3rd to 7th, Calgary.—*Col. christina*, *A. lais*, *A. Nevadensis*, *A. artonis*, *Thymelicus hylax*.

July 10th, Morley (now Canmore) station, C. P. R.—*Lycæna shasta*, *Arg. monticola*.

Aug. 1st, Laggan.—*Anthocharis hyantis* and *ausonides*, *Chrys. mariposa*, *Chion chryxus*, *Colias elis*. This was a grand point for collecting. Emerald Lake, about 4 miles from here, is a lovely spot, and the vegetation plentiful and varied, with large numbers of insects.

I have curtailed this as much as possible, but I shall be glad to correspond with anyone going to collect this season, with a certain feeling that, if the eggs of *Colias elis* can be obtained, we shall have the mystery cleared up about the ♂ of this beautiful fly.

AGAIN RILEYA.

BY L. O. HOWARD, WASHINGTON, D. C.

If all controversial writings were as happy as Mr. Ashmead's last, readers of the CANADIAN ENTOMOLOGIST would not regret the space occupied, and I am glad that one side of the controversy is interesting reading. I hope I may be allowed space to say that Mr. Ashmead admits in conversation that he has erred in his statement that my first publication of the description of Rileyia was in the CANADIAN ENTOMOLOGIST for Oct., 1888, as I have shown him the last page of *Entomologica Americana* for July, 1888. May I also state dates once more? Mr. Ashmead's first mention of Rileyia was published in his synoptic table in *Entom. Am.* for June, 1888. My full description was then in the hands of Mr. Smith, and was published in *Entom. Am.* for July, 1888. Mr. Ashmead's full description appeared in the Kansas Agric. Exper. Station Bull., in July, nine days later than mine. Entomologists following Mr. Ashmead's views are perfectly at liberty to use the excellent generic name he has proposed for my Rileyia, while for the use of those who adopt my views, (and I am happy to say that several well-known entomologists have expressed themselves in my favour), I venture to propose for the Eurytomid genus which was called Rileyia, the appropriate generic name *Ashmeadia*, as indicating my appreciation of Mr. Ashmead's unflagging industry as an entomological worker.

CORRESPONDENCE.

COLIAS CHIONE, CURTIS.

Dear Sir: It may be of interest to some of our readers, who are interested in the genus *Colias*, to know that Mr. F. Fitz Payne, (who accompanied Lieut. Gordon's expedition on the "Alert" to the Arctic regions), brought back amongst his collection a single specimen of a most peculiar green coloured female *Colias*. It was sent to Mr. W. H. Edwards first, who examined it, but did not pronounce decidedly upon its name. A few weeks ago Mr. Henry Edwards was spending an afternoon with me, not long after his visit to the British Museum, and he assures me I have got the ♀ of *Colias Chione*, Curtis. The only other specimen known being in the British Museum. I observe that Mr.

Kirby has placed this in his catalogue of Diurnal Lepidoptera as variety "A" of *C. Boothii* Curtis, and both *Boothii* and *Chione* were taken in Ross's 2nd voyage, and both the species and variety were described by Curtis, in 1835. It would be a curious coincidence if, after an interval of over half a century this turned out to be a good species. I have written to a friend, who constantly visits the British Museum, for full particulars and description of the specimen in the collection there, and will state his views through the medium of the CANADIAN ENTOMOLOGIST in a future number.

GAMBLE GEDDES, Toronto.

ARCTIA PHYLLIRA, DRURY.

Dear Sir: When I was in London a year ago, working on the Society's collection, I found amongst the Arctians one that clearly did not belong to any of the forms represented therein; it had the label of A. P. Saunders attached, bearing date July 6th, 1886. Being unknown to me I labelled it "undetermined," and laid it aside; recently, however, when turning over some of the books in the splendid library of the Society, I found the unnamed Arctian unmistakably represented on plate lxiv, vol. 2 of Smith & Abbot, and named *Phalena phyllira*; also in Westwood's Drury, vol. 1, plate vii, fig. 2. It is quite an attractive form, and new to the Canadian list. Mr. H. S. Saunders also has a specimen, taken at electric light, Sep. 6th, 1887.

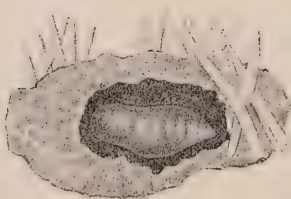
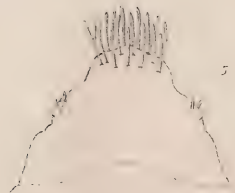
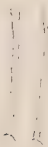
J. ALSTON MOFFAT.

NOTE.

Later on there will certainly be more to be said respecting certain points touched upon by me in the CAN. ENT. for 1888, but there are four things it will be useful to refer to now. Since writing on *Nathalis iole* (p. 156) I have found that there exists a form of the ♂ in which the "orange spot" is yellow during life. With regard to the forms of *Colias eurhytheme* in this locality (p. 201), I now find there is a short flight of genuine *criphyle* here in September, but the specimens are not so extreme in their divergence from *autumnalis* as one Mr. W. H. Edwards sent me (locality not stated). I shall have more to say about all these forms of *eurhytheme* later on. The yellow spider on pink flowers (p. 176) and the Asilid fly attacking *C. eurhytheme* (p. 202) have been kindly examined by Dr. C. V. Riley and pronounced to be species of *Misumena* and *Stenopogon*.

T. D. A. COCKERELL, West Cliff, Col.

Mailed March 7th.



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No. 4.

DESCRIPTION OF THE PREPARATORY STAGES OF ARGE GALATHEA, LINN., WITH NOTES ON CERTAIN SATYRINÆ.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG. — Sub-ovoid, broadest on lower third, the base flattened; covered with a very slight rhomboidal network over the upper third, with low knobs at the angles; on the middle the network is still more slight, but the knobs are distinct, and on the lower third the knobs are minute and unconnected by lines; summit flattened, concave; the micropyle in centre of very fine network without knobs; colour bone-white. Duration of this stage about 20 days.

YOUNG LARVA. — Length, at 12 hours from the egg, .1 inch; thickest anteriorly, tapering to 13, which ends in two short sub-conical tails; colour yellow, with a tint of red; the tubercles arranged as in *Erebia*, forming three longitudinal rows on either side; these are small, conical, each with a long curved whitish hair; feet, legs and under side same colour as upper surface; head sub-globose, broader than 2, granulated, with a few whitish points and long hairs; colour brownish-yellow. The larvæ hibernated from the egg.

After First Moul. — Length at 12 hours, .18 inch; colour yellow-buff; a narrow pinkish mid-dorsal stripe, a sub-dorsal same width, then as much of buff on side, and a broad pinkish stripe to the basal ridge, which is yellowish; under side, feet and legs, yellow-brown; body covered with a downy coat of yellowish hairs from fine points, and among them on each segment are black hairs from larger and darker tubercles; head sub-globose, yellow-brown, with yellow and black hairs like those of body. Duration of this stage 11 days.

After Second Moul. — Length .3 inch; stout; yellow-buff; a darker mid-dorsal stripe, and a similar broad lateral band; the basal ridge paler than the ground; under side greenish-buff; thickly covered with buff hairs; head green-buff. Duration of this stage 10 days.

After Third Moulting.—Length .65 inch. At nine days from this moult was full grown.

MATURE LARVA.—Length 1.1 inch ; stout ; thickest at 4 and 5, tapering rapidly to 13, and ending in two short sub conical tails ; colour buff the dorsal area of a yellow tint, the sides reddish ; the under side a green tint up to the red-buff ; feet and legs same ; a brown mid-dorsal stripe ; on side the band a shade darker than the ground ; the basal ridge lighter, or yellowish ; body thickly covered with rather stiff, long hairs ; head small, sub-globose, a little depressed at top ; colour greenish-buff, with many buff tubercles and hairs both long and short. (Fig. 1.)

Soon after, the colours became paler, the bands faded, and the larva was lethargic, eating nothing, but lying at the top of the sod curved like a figure 6. At 18 days from third moult pupated in the grass, unattached.

CHRYSLIS.—Length .54 inch ; breadth at mesonotum .18 inch, across abdomen .24 inch ; abdomen remarkably stout (one-third broader than the anterior segments), conical, but irregularly so, the ventral side and the whole body up to thoracic segments being greatly swollen, while on dorsum the curve is slight, and rises no higher than does the mesonotum ; this last is very low, rounded both ways ; the head case short, rounded at end, rounded transversely and at the corners ; at each shoulder, over the thoracic spiracle, a black-brown, corrugated shell-like process standing out obliquely and quite prominent, in the middle sometimes a little separated from the surface of the body ; cremaster short, bluntly pointed, on dorsal side having same curve with abdomen, on ventral side excavated, with the edges thickened, horse-shoe shaped, and having at the end a brush of short, stiff bristles, straight, not the least hooked. (Figs. 3, 4, 5 to 8.) Duration of this stage 14 days.

This pupa is very like that of *Eudamus Tityrus* and *Lycidas* ; the same dorsal and ventral outlines, same slope from mesonotum to top of head, same form of head case ; and the thoracic spiracle protector (Fig. 8), as Mr. Scudder calls it, is similar in both ; in *Galathea* this process is more curved and shell-like, and a little more projected from the surface, but they are essentially of same character.

GALATHEA flies in Europe and Algeria, according to Kirby. It is prettily checkered in black and white, has a slender body, and large wings in proportion, as in most of the family. It has no near ally in North

America. Kirby places its genus, which he calls *Melanargia*, next to what he calls *Eneis*, Hübner, but which should read *Chionobas*, Boisduval.*

The imago and two varieties of the larvæ are figured in Humphrey and Westwood's *Brit. But.*, and what purports to be the pupa, suspended by the tail from a leaf of grass. There is no resemblance at all between the pupa so figured and the true pupa. The description of the larva is limited to one line, "yellow-green, with a dark line down the back and on each side."

In Buckler's "*Larvæ of British Butterflies and Moths*," 1886, (a book which every working Lepidopterist ought to own, and published at a very low price, to wit: ten dollars for the two volumes so far issued, the first one covering the *Rhopalocera*); on plate iii. is figured the adult larva of *Galathea* and the pupa. I have had this larva copied on my plate, Fig. 1. The text, which is by Rev. J. Hellins, represents the pupa as found on the sod, and unattached by the tail. This figure suggests an affinity to certain moths, noctuids especially,† and led me to wish to breed the species from the egg. M. Paul Chrétien, of Paris, kindly obtained eggs and sent them in a quill, in letter. They reached me 3rd Aug., 1886, thirteen days out, and hatched the next day. The larva, when about to come forth, cut the top in a circle, but not completely around, and raising this trap door made its way out, the door immediately falling back. The egg looked almost uninjured. The larva did not eat the egg shell. I mention this, because Mr. Hellins says the young larva "eats up its egg shell almost entirely," and he adds, "and thenceforward feeds on grasses," also, "it hybernates when very small." My larvæ hybernated at once from the egg, just as the larva of *Satyrus Alope* does. I put the little animals in the cellar, and later sent them to Clifton Springs, N. Y., to go in the refrigerating house there. They came back 21st March, 1887, in good condition. On 12th April, one passed the first moult. This larva

* There is no such genus properly as *Eneis*, Hübner. There is a coitus of that name in Hübner's *Verzeichniss*, made up of mixed *Chionobas* and *Hipparchia*, and another one also made of the same two genera. By calling a coitus a genus, which it is not and was not intended to be, eliminating the *Hipparchias* from both these coitus, dovetailing together what remains, and calling the manufacture *Eneis*, with a label Hübner, 1816, we get what is called the genus. The makers of lists and catalogues about 1870 hit on this contrivance, and many European authors have come to adopt the name *Eneis*. In this country it has not met so favourable a reception. Perhaps the first definition of the genus *Eneis* (and a definition is indispensable to recognition) was given by Mr. Scudder, in *Syst. Rev.*, 1872; but *Chionobas*, Boisduval, 1832, has the priority.

† This figure resembles the larva of *Agrotis*, all but the terminal segment, which is Bombycid.

passed the second moult 23rd April, the third 4th May, and pupated 22nd May. I succeeded in getting but the one larva to pupation, and having accidentally injured the surface of the pupa, I put it in alcohol. The next year, M. Chrétien sent more eggs in same way. They hatched, and the larvæ went at once into lethargy, as before. They came back from New York, 6th April, 1888. I recorded that one was about to pass its first moult on 20th April, that two were at same time about to pass second, and two had already passed second on 5th June; that the appearance and attitudes of these larvæ are very much like noctuid larvæ. They are obese, sluggish, and spend most of the time lying on their backs or sides on the surface of the sod, the head and next segments bent in; or else they lie in a complete ring, the tail and head meeting. If resting on a stem of grass, the body is supported by the pro-legs only, the anterior segments arched, the feet not touching the stem. Now and then I found one feeding, but they did this mostly at night. On 13th June, one larva was evidently near pupation, by the pale hue of the skin and the disappearance of the lines. I record that it lies on its side and back between two stems, wedged in, its feet in the air. Next day it had got away from the stems and was lying on its back, much doubled up (Fig. 2). The following day it had pupated just where I had last seen it, unattached by the tail.

By 17th, I noticed that a second larva had fixed itself as I had recently seen one of *Erebia Epipsodea* do when about to pupate. It was nearly an inch clear of and above the sod, had drawn a few leaves of grass together by a few threads and rested among them upright, holding to the edge of a leaf by the prolegs, the dorsum much bent and turned to the left. An hour later the larva had loosed its hold and slid down, and was sticking upright in the sod, but had reversed its position, the dorsum now facing to the right. There it pupated, upright.

On 18th, another larva was lying on its back, like the first one mentioned. I had had a long search for it, and feared it had escaped, but by clipping the grass stem by stem, it was found low down in the sod, and there it pupated, 20th. The fourth also pupated, but among the roots, and was found only by pulling the sod in pieces. The fifth pupated in the night of 4th and 5th July. It had fallen off the bag which covered the plant, and was lying motionless on the earth. I laid it on its side among the leaves, and there it pupated, spinning no thread. From these pupæ I got five butterflies, the first one on 28th June, the last in middle of July.

Buckler figures what is called the third moult, and again the fourth moult. But, as I have said, my larvæ, in both years, passed three moults only. From the size of the figures I should say that both represented the same stage, one just after third moult, the other at maturity. Nothing is said of moults in the text. The young larva is described, then at length of 2.5 mm., and the mature larva at 30 mm. Mr. Hellins agrees with Westwood that the colour is variable, being buff, but sometimes green. All my larvæ were buff. It is stated that the larva "becomes full fed in June, and changes to pupa without suspending itself in any way, or making a cocoon," and the author adds, "I think it" (in natural state) "would hide itself, as my example did. I found they had got among the thick moss with which I had furnished the bottom of their cage, and apparently made little hollows for themselves by turning round." The pupa is described at length, but the curious "thoracic spiracle protector" is passed over so slightly that one would not suspect the nature or form of it, merely saying, "the pair of spiracles at the shoulders large and dark brown." *

The pupa which I had in 1887 was sent to Mr. Scudder, with no intimation of the species or its history, and he was asked what he thought it might be. His reply was: "The pupa you send seems very like one of the larger skippers, but I do not see any enlargement of the antennal tips, and think it must be a moth. The 'ear-like' projections are the thoracic spiracle protectors, which are entirely like this in *Tityrus*." As before said, *Eudamus Lycidas* pupa has the same sort of process.

I bred *Erebia Epipsodea* to imago in 1888, and found that here also the pupa was unattached. The end of the cremaster has a few short, straight bristles, both fewer and shorter than those of *Galathea*. Mr. Fyles bred *C. jutta*, and it pupated down in the moss, unattached. Mr. Scudder has described the mode of pupating of *C. semidea*, also down in the moss or among rocks, unattached, and neither of these have any bristles at all on the cremaster. This species is also described as curling up in a ring. *C. chryxius*, which I bred to pupa last year, is without bristles. It behaved like *Galathea*, pupating in the sod. Buckler figures

* The accompanying plate shows the larva of *Galathea*, Fig. 1, copied from Buckler; Fig. 2 shows the attitude on the sod when near pupation; 3 and 4, the pupa; 5 and 6, the last segment and cremaster, dorsal and side view, with the group of terminal bristles; 7, the single bristle; 8, the thoracic spiracle protector.

Erebia Blandina as pupating upright in the sod, also unattached; and I have copied this pupa on the plate, 9.

More remarkable still is Buckler's figure of *Hipparchia Semele* pupa (iv). It looks like *Tityrus* also, but is stouter, and the ventral side protrudes as in that species and *Galathea* (Fig. 10). Mr. Buckler's own account accompanies the plate. He dug the larva out of the sandy ground near the sea shore. "The captured larva, on being placed under a glass on a pot with its native food, immediately burrowed in the sandy earth, and the few times it was seen on the grass were always at night. On the 23rd June I searched for the pupa and found it in a hollow space a quarter of an inch below the surface, the particles of sand and earth slightly cohering together, and close to the roots of the grass, yet free from them. The pupa was obtuse, rounded, turned and smooth, and wholly of a deep mahogany colour." That is a strange recital! An Arctic *Chionobas* may be compelled by the severity of the climate to live within the moss and pupate there, but here is a species in the temperate regions, at the level of the sea, burrowing in the sand like a cut-worm, coming out at night to feed and returning to ground cut-worm fashion, and pupating under the surface in a manner common to many families of the Heterocera, even certain genera of Sphingidæ.* Probably many other species and genera of Satyrinæ have larval habits such as I have related. Of the vast number of species but few are known in the early stages. Mr. Scudder says, p. 119: "We know of at least eight European species (besides *Galathea*), mostly referred to *Satyrus*, but some to *Epinephele* and *Pararge* as well, the chrysalids of which are not suspended."

We have in America a butterfly, *Ridingsii*, provisionally placed in the genus *Hipparchia*, but which is not congeneric with *Semele*, the larva and pupa of which may have the form and habits of *Galathea* or even of *Semele*. I have its larvæ now hibernating.

The Satyrinæ are a very numerous family, with many natural genera, and most of these have numerous species. Kirby, in 1871, made 80 genera, and as many species have been described since, and of making of genera, natural and artificial, there is no end, I dare say there are 150 genera of some sort in the books to day. The butterflies are all or nearly

* "AGROTIS C. NIGRUM feeds by night on the tops of red clover, hides in the ground by day, pupates in a loose cocoon on top of the ground beneath rubbish, or even without any cocoon; but most Agrotids pupate in the ground. All the larvæ of the genus have the habit of curling up."—*French*. I sent Prof. French one of these plates. He writes:—"No. 10 is precisely as I have seen the *Agrotis* pupate."

all feeble-bodied, feeble-winged, of weak and intermittent flight, and frequent woods and grassy spaces, loving the shade. "Distinguished by their peculiar flight, which is of a feeble, wavering, dancing character, and not long sustained; neither do the insects rise far above the ground. Wallace, in writing of the species found on the Amazons, says he does not 'remember to have ever seen any species rise four feet from the earth, while the greater part of them *do not exceed as many inches.*' Some genera of the allied Morphinae are said by Wallace to be 'truly crepuscular, never flying by day except when disturbed. * * * They remain hid during the day in the gloomiest shades of the forest.'"—Scudder.

As before set forth, here are four genera, Arge, Hipparchia, Chionobas and Erebia, in which the preparatory stages of species resemble in habits and form the Hesperidae and certain moths. The last two are Arctic or boreal. The American Erebias, *Epipsodea* and *Magdalena*—this last represented on the shore of the Arctic Sea by *Fasciata*, (see But. N. A., vol. iii, pt. vii for this,) the two evidently being forms of one species—fly at the extreme north, or on the summits of the loftiest peaks of the Rocky Mountains. Chionobas *Semidea* also flies within the Arctic circle, as far north as Cumberland Island, and in Labrador, but there are isolated colonies at two other points, namely, the summit of the White Mountains of New Hampshire, and the high peaks of the Rocky Mountains. *C. jutta* is boreal, being found in Labrador; but it reaches farther to the south than any other of its genus—to Quebec, Ottawa, and Bangor, Maine, where it flies at low elevations. Arge and Hipparchia are found inhabiting the temperate parts of Europe, and the first of these even crosses into Northern Africa. Erebia *Magdalena* and Chionobas *Semidea* live under the severest conditions. Mr. David Bruce says of *Magdalena* and its habitat: "It is found in the most uninviting looking spots it is possible for a naturalist to explore—black, barren, detached rocks, that look as if an immense peak had fallen and split into fragments; hardly a blade of grass or a patch of lichen to relieve the utter desolation. I have never found this species but among such broken rocks, varying from 12,000 to 14,000 feet elevation. The sun gleams out, and awakened into activity by its beams, comes *Magdalena*, flitting leisurely, then suddenly taking an upward flight, it soars around. Another of same species springs up from the rocks, the usual skirmishing chase ensues for a few minutes, the sun is again obscured, and the insects disappear as if by

magic, and will not be seen until it is bright again. I have met with it from June 28th to July 18th." As Mr. Bruce searched for two seasons for this particular and exceedingly rare butterfly, this period of 20 days in which he found it, may be taken for the duration of the species in its imago stage. It is not probable that the life of one of the individual butterflies lasts one week. All butterflies die speedily after copulation (♂) and laying of eggs (♀), even in temperate regions. Many species in the same regions come from pupa with eggs mature, and copulation takes place almost at once, often before the wings of the female are dry, and in one well-known case, *H. Charitonia*, often before the imago is out of the pupa shell. We may be sure that nature would allow of no loss of time at 13,000 elevation. The existence of the species must depend on getting the eggs laid and protected. Mr. Bruce is of the opinion that there is an annual brood of the imago. I myself had thought there could be but one every two years, from my experience with allied larvæ, which are excessively slow in growth. My imagos of *Galathea*, as stated, showed 17 days between the emerging of the first and the last from pupa, and yet they were all hatched on same day. The 20 days spoken of by Mr. Bruce, as said above, represents the time in which the species was alive in the imago, not the life of one individual by any means. Spending therefore 51 weeks out of 52 in, or on, or under the ground as egg, larva, or pupa, one week in the imago, hiding among the rocks whenever the sun is obscured, and it is often obscured, or when fierce winds blow, and there must be very little time when a stiff breeze or a tempest is not blowing, the temperature every night, as Mr. Bruce tells us, as low as 30° Far., at the least, ice forming wherever there is a bit of water—is it possible to conceive an existence more unsuited for a creature dependent on sunshine than this *Magdalena* lives, imprisoned on those summits? Yet, the species must have lived so through untold ages.

For the history of *Semidea*, in New Hampshire, I will quote from Mr. Scudder, in his grand work, the Butt. N. E., pages 589 et seq: "These two butterflies (*Argynnis Montinus* and *Chionobas Semidea*) may be looked upon as the oldest inhabitants of New England, which followed the retreating ice sheet in its progress northward. They were the first of their tribe to fly over the barren fields of New England, where the earliest verdure began to follow the withdrawing ice, and moving with it, step by step, were at last, some of them, beguiled by the local glaciers in the

White Mountain region, long after the main glacial sheet had left these mountains far in its rear, and until connection with the main body was finally cut off." And quoting Mr. Grote on this species and its ancient history: "They advanced behind the deceiving local glaciers, step by step, up the mountain side, pushed up from below by the warm climate, which to them was uncongenial, until they reached the mountain peak. Here, blown sidewise by the winds, they patiently cling to the rocks; or in clear weather, on weak and careful wing, they fly from stemless mountain-pink to blue-berry. Drawn into the currents of air that sweep down the mountain-side, they are forced downwards to be parched in the hot valleys below," Mr. Scudder continues: "It will be asked how it is possible that such delicate organisms as butterflies can maintain themselves *in such a bleak and inhospitable region* as the summit of the White Mountains, where a Greenlander would find it impossible to live in comfort, inasmuch as he would be exposed not merely to the cold, to which he is no stranger, but to the *fiercest and most biting winds, with an amount of humidity accompanying them which would seem to be almost fatal to existence.*" The author then speaks of the long larval period, during which the species is protected among the rocks and snow. Then continuing with the imago, it "invariably closes its wings back to back, and settles upon one side as if reclining, the *point of the wings away from the wind*, where it clings to the roughnesses of the rocks, and is seldom blown from its foot-hold. * * * In the imago state, *it cannot bear transportation so much as 3,000 feet vertically* to the base of the steeper slopes, at least if this transportation is effected in a rapid manner. *Indeed their efforts at flight under such circumstances are so pitiable* that it would seem very doubtful if the butterfly hurled deep down into the ravines by the fierce blasts which may at times catch it unawares could possibly remount the steep slopes. That such cases of destruction may occur with so feeble-winged a butterfly seems by no means impossible," etc.—the author relating how he had seen these insects swept over the cliff, etc. On page 145, we read also: "They can offer no resistance to the winds, and whenever they ascend more than their accustomed two or three feet above the surface of the ground * * * they are whirled headlong to immense distances," etc. He then relates how this butterfly escapes capture, "by edging its way afoot to the brink of a crevice," and dropping into same. And that he took three healthy females down the mountain on the railway train, and before half the descent was made they

were visibly affected, and by the time the tree line was reached—elevation 4,500 feet—they were gasping for air. At 2,800 feet, where he was staying, he thought them dead, and finally killed them, as they “gained no strength at the end of twelve hours.” Doubtless similar careful observations and experiments with *Magdalena* would reveal a similar history. Mr. Scudder, p. 144, thinks it probable that the larval stages cover two winters. If so, the imago is biennial, as *C. Bore* of Europe, is said to be: “*Bore* hibernates twice as caterpillar and changes to chrysalis in May, in the winter quarters of the larva, free, in sand, between roots of grass under the surface of the ground.”—But. N. E., p. 126. That is, another species of this genus has the larval habits of a noctuid moth.*

The existence of *Magdalena* seemed as bad as bad could be, but these accounts of *Semidea* indicate a worse climate and therefore severer trials. These are two of the feeblest butterflies in the N. Am. fauna, and this sort of existence has endured at least since the glaciers retreated, and no one can guess how many years longer.† When we read that butterflies have come down from the Tertiary period unchanged, we may allow for *Semidea* a vast antiquity.

Members of the *Semidea* species dwell to-day within the Arctic circle, in Labrador, in the White Mountains of New Hampshire, and in the Rocky Mountains in Colorado, separated by vast distances. Mr. Scudder shows that the mountain colonies cannot exist in the low grounds, cannot even

* The history of *Semidea*, as related by Mr. Scudder, mostly from his personal observations, is worth the price of the whole work; and I recommend every person interested in butterflies to make it a part of their library without delay. I differ with Mr. Scudder radically about many things, the restriction of genera, the resurrection of obsolete names, the use of Hübner's *Coitus* and *Tentamen* names for genera and families, but in other important and essential points this work of his is and will forever remain unapproachable. The wealth of illustration is amazing, not only of the butterflies themselves, but of every part and organ of them, and what has never been attempted before except on a limited scale, the eggs and young larvæ are shown in greatly magnified and admirably executed figures. In any future system the eggs and young larvæ will form an important part. The time is coming when classification based on features of the imago alone will be thrown over, and the new arrangement will take consideration of all three of the preparatory stages. For these matters and the anatomical details, worked out with wonderful ability, and the life histories and distribution worked out with exceeding care, the Butterflies of New England will be a standard work, and no student can possibly get along without it. The edition is limited and the plates cannot be reproduced; therefore, I say to my friends, subscribe without delay.

† Mr. Geikie, in the Great Ice Age, p. 135, is of the belief that the last glacial period terminated 80,000 years ago, and began about 240,000 years ago.

descend the peaks ; therefore there cannot have been communication between these branches since the retreating ice stranded the two southern colonies. Yet they are not distinguishable from one another. Examples from Labrador, even also from Ungava Bay, lat. 59°, are precisely like examples from the White Mountains and Colorado, and in fact these three branches of the species are not known to differ by a scale or a hair.

(*To be continued.*)

DR. CHRISTIAN ZIMMERMANN.

BY H. A. HAGEN, CAMBRIDGE, MASS.

(*Continued from page 57.*)

The following is a list of the entomological works of Dr. C. Zimmermann :—

1. Monographie der Carabiden, Erstes Stueck, Berlin and Halle, 1831, 8vo., pp. 8 and 76, contains the family Zabroides, five genera, with twenty-six species ; review in Oken Isis, 1832, vol v., p. 539, vol. x, p. 1117 ; extracted in Silbermann Revue, 1833, T. I., p. 45-47. The author's copy belongs to the library of the museum.

2. Monographia Amaroidum.—The work was interrupted by the author's voyage to America. The library of the museum possesses out of Zimmermann's own library a few sheets, printed in Europe in 1831, in two parts (proof sheets). The work is written in Latin. First part, p. 1-48 (three sheets), the general description of the family Amaroides :—I. de capitis partibus, p. 5 (os, instrumenta masticandi) ; II. de trunci structura, p. 16 (collum, pectus, pedes, alae) ; III. de abdomenis segmentis, p. 31 (dorsum, venter, appendices) ; general division of the Adephaga and Carabidæ, p. 36, in 12 stirpes ; de corporis partibus externis, p. 40, the plate (table 1) is not present, probably never printed, then follows the general description, p. 44, which gives the characteres sexuales (not finished), p. 48.

The second part (also not finished), Monographia Amaroidum, quotes the first part as :—Dispositio methodica nova Coleopterorum Adepha-

gorum. The characters of the family (p. 1) are followed by the systema of the family in twelve genera (p. 11).

1. *Leirus* Megerle, p. 12, twelve species, four new.

2. *Lioscelis*, Zimm., p. 31, nine species, two new (not yet finished). The third sheet is by error marked the fourth, and the pagination, p. 49-60, is wrong, instead of p. 33-48.

I have given purposely a detailed account of the two papers, only known by proof sheets, out of Zimmermann's library, as they contain, indeed, the most elaborate account of the general characters of the family. The description of the genera and of the species, as far as contained in the papers, is very detailed.

The paper on *Amara* is quoted in my *Bibliotheca* II., p. 304, No. 2. It is in some way different from the Latin paper just described. It is published in German and translated in French, also the papers Nos. 3, 4 and 5. Besides those papers, after his death Dr. J. L. LeConte has published the two well known in the *Tr. Ent. Soc.*, Phila., 1868, on *Scolytidæ*, and in 1869, synonymical notes on *Coleoptera*. Dr. J. L. LeConte's *Scolytidæ*, p. 149, says:—"Among the MSS. of my deceased friend, Zimmermann, I find several partially completed memoirs, which contain not only systematic ideas of much value, but descriptions of many new species belonging to our fauna." Nevertheless he has published nothing more of them, and I am informed by Dr. J. H. Horn that nothing more of Zimmermann's papers was found after Dr. J. L. LeConte's death.

The following report is given in a letter from Zimmermann to Th. W. Harris, July 4, 1853 (in the library of Boston N. His. Soc.), it must not be forgotten that the letter was written before Chapuis and Candèze appeared:—

What I have observed about the beetles, grubs and their use for a methodical synopsis I will subscribe here with a few words only, for the thermometer rises again about 100°.

COLEOPTERA.

A. Larvæ of 13 segments, full of folds, never with eyes.

1. *Petalocera* (= *Lamellicornia*), forming three sub-divisions, (*a*) containing *Oryctes*, *Melolontha*, *Copris*; (*b*) containing *Trox*, etc.; (*c*) containing *Lucanus*, etc.

2. Rhynchophora, (a) containing *Hylurgus*; (b) containing *Curculio*; (c) containing *Brenthus*.

B. Larvæ of 13 to 14 segments (head and prolegs included, each for one segment), without folds, with or without eyes.

3. Tetramera, (a) containing *Capricornia*; (b) containing *Bruchidæ*; (c) containing *Phytophaga*.

4. Pentamera, (a) containing *Sternoxa*, (a) *Buprestidæ*; (b) *Elateridæ*, (c) *Cebrionidæ*; (b) containing *Cleridæ*; (c) containing *Lycidæ*.

5. Heteromera.

C. Larvæ of 13 to 14 segments (mostly 14), above scaly, swift footed, always with eyes.

6. Adephaga.

7. Rhypophaga.

8. Brachelytra.

I have directed all my powers upon the investigation of the larvæ. Up to this day, however, I did not discover any more or better distinctive characters than those given above, and which appear to contain all the external characters worthy to be trusted, for you know already that numbers of them change their dress and form with each moulting. I may remind you here of the curious transformations of the larvæ of *Meloe*, as investigated in the Linnean Transactions, vol. xx. These little creatures appear as frequently delineated, at first with long legs for swift running, which is necessary for them in order to reach their final abode; having accomplished that they become by degrees fatter and more sluggish, whereby, curiously enough, the length of their legs decreases. The apparent difference between the larvæ of *Buprestis* and *Elater* may be explained upon similar necessities, for the body of the larvæ of *Buprestis* is soft and necessarily so, living as it does in hard and unyielding substances, whereas the body of the larvæ of *Elater*, which lives in more damp, soft and cold substances, will find its stiff and hard dress more comfortable than it would a softer one. The larvæ of *Buprestis*, as well as that of *Elater*, are of a structure sufficiently similar to be placed in the same great division (B), and more similarity was not necessary, for the structure of the beetles themselves had to decide their systematic station.

POPULAR AND ECONOMIC ENTOMOLOGY.—No. 2.

THE APPLE TREE TENT CATERPILLAR—THE AMERICAN LACKEY MOTH
(*Clisiocampa Americana* HAR.)

BY JAMES FLETCHER, OTTAWA.

There are two kinds of caterpillars which every year commit serious depredations in our Canadian apple orchards, although they by no means confine their attentions to that tree. These are the larvæ of the American

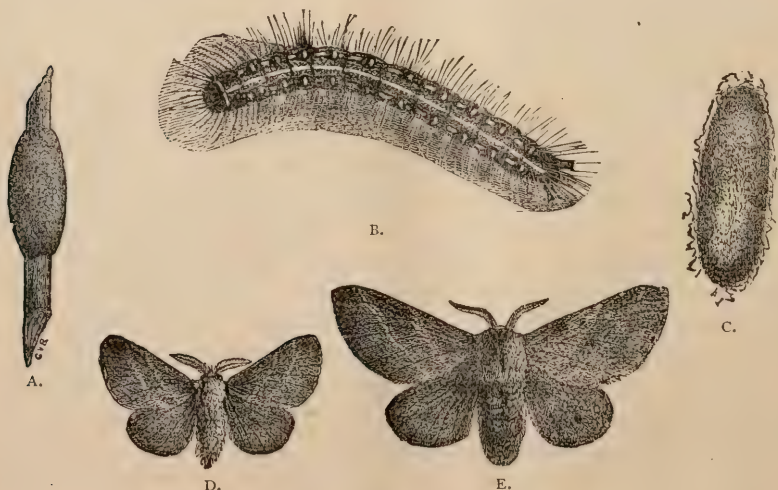


FIG. 1.

and Forest Lackey Moths, two species of brown moths which frequently fly into houses at night during July, and draw attention by their head-long, reckless flight, dashing themselves against the ceiling and the walls, and very often finishing up by getting into the lamp chimney. Speaking generally, there is a great resemblance between these two insects in appearance and habits, and the same remedies are applicable for both; when examined carefully, however, they differ considerably in all their stages, and may be easily recognized. They belong to the *Bombycidae* or

Spinners, a family which contains the silkworm moths and several other thick-bodied, hairy moths, with large wings but small heads, bearing comb-like antennæ and having the mouth parts imperfect, or as in those now under consideration not developed at all. The caterpillars of the *Bombycidae* are usually hairy or tufted, and when full grown spin a cocoon for the protection of the short, thick chrysalids.

At Fig. 1 the different stages of the American Lackey Moth are given. This species appears in the perfect state in the beginning of July, about a week earlier than the other species referred to above, which is known by the name of the Forest Tent Caterpillar *C. distria* Hüb. (*C. sylvatica* Har.)

The American Lackey Moth is a pretty species of a dull but rich reddish-brown colour, having the upper wings crossed obliquely by two clear, whitish, parallel lines. In rare instances these show faintly on the lower wings also. The fringes of the wings are chiefly of the same colour as the oblique lines. The space enclosed between the light lines is paler than the rest of the wings in the males, but of the same colour or rather darker in the females. On the under side, all four wings are crossed by a well-defined, irregular, whitish bar. The perfect insects having their mouth parts undeveloped partake of no food, but devote the whole period of their short lives to the perpetuation of their kind. As soon as they have paired and the females have laid their eggs they die. The eggs are deposited in rings upon the smaller twigs of various trees, usually within a short distance of the tips. Each egg-cluster contains from 200 to 300 eggs, which, when laid, are covered with a liquid glutinous substance which soon dries and cements them firmly together, and protects them from the weather.

A surprising point in the life history of these insects is that about a month after the eggs are laid, the young caterpillar is fully formed inside the egg and it remains in this condition all through the winter, only eating its way out from the egg in the following spring when the leaves expand. Immediately upon hatching the young caterpillars consume the glutinous covering of the eggs, and then lose no time in attacking the foliage. They at once begin the construction of their tent, which is a web of fine silk, spun in the nearest fork of the twig upon which they were hatched. This tent is increased in size as the caterpillars grow, and if left undisturbed is sometimes nearly a foot in diameter. The caterpillars are very regular in their habits, marching out in regular procession, each following close behind the

one in front of it. From the habit of the larvæ of this genus of marching out to feed in bodies they are known in Europe as "Processionary Caterpillars." When their appetites are satisfied they return again to their tents to rest. They do not feed at night nor in stormy weather. They usually do not leave their tent until after nine in the morning, and have all returned before sundown. They are generally inactive in the middle of the day.

When full grown the caterpillars are two inches in length, and beautifully marked with black, white, blue, yellow and brown in the pattern shown in Fig. 1., B. The continuous stripe down the back is white, and serves as a distinctive mark by which this species can be known at once from the Forest Tent Caterpillar—Fig. 2—which has this dorsal stripe broken up into spots. This latter also differs in not constructing a tent, but merely spins a mat of silk on the side of a tree, or upon one of the large branches, on and near which it lives, more or less, in community; but it has not the same social habits as its relative. Just before they spin their cocoons, the caterpillars wander about very much, seeking for a suitable place. The cocoon, Fig. 1., C., is greenish yellow, and contains a powdery material like finely ground sulphur. The moths emerge in about eighteen or twenty days after the cocoon is made.



FIG. 2.

Remedies.—The most successful remedies with these insects all come under hand-picking. During the winter or early spring the egg-clusters can be easily collected and destroyed; they are always laid upon the small twigs and near the tips, so that if a dull day be chosen they can be easily detected against the sky, and can then be cut off and burnt, when, of course, the trees are exempt from attack, until eggs are laid again next year. If this precaution is neglected, the nests, which are conspicuous objects before the foliage is fully expanded in spring, must be cut off and destroyed. An invasion from neighbouring trees can be prevented by tying a strip of cotton-batting round the trunk, which the caterpillars have difficulty in climbing over.

THE LARVA OF LIMACODES INORNATA, G. & R.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

Larva.—Elliptical and much flattened, the sides rising slightly to two dorsal ridges, only a little elevated, these ridges diverging somewhat towards the anterior and posterior portions of the body. Around the outline of the body is a series of flattened pointed projections for the last eight segments, furnished on their sides with fine, short hair. These projections occur on each segment after the fifth, the two on the last segment somewhat longer than the others, and directed nearly straight backwards. Colour green, a reddish line on the angulated outline of the anterior segments; the dorsal ridges marked with a narrow yellow line, which is interrupted between two dorsal yellow spots with red centres. These spots are conspicuous though small.

Food Plants.—Maple, wild cherry, hickory, etc. Like most of the *Cochliinæ* a very general feeder.

A good figure of this insect is to be found in Harris's Entomological Correspondence,* and in the text Dr. Harris says: § [The larva is] "in form somewhat like an *Oniscus*, being oval and flattened, with lateral tooth-like appendages fringed with hairs. General colour green, with lateral rows of minute, ocellated spots, each pupillated with a black dot; a dorsal row of dark spots, with two of a rich scarlet colour * * * This insect does not sting."

The difference between this larva and that of *Limacodes scapha* Harris† is very marked. While *L. scapha* is a thick larva, resembling a lump of some substance adhering to the leaf; the present species, as above stated, is much flattened, and furnished with its remarkable tooth-like projections. In fact, before the imagines of *L. inornata* were developed, I had no idea that the insect could be congeneric with *L. scapha*.

Two males, raised from these larvæ, differ somewhat from the original description by Grote and Robinson,‡ so that, to them, the name of "inornata" hardly applies. In this form the secondaries are somewhat

* Entomological Correspondence of T. W. Harris, edited by S. H. Scudder, 1869. Plate II., Fig. 7, and Plate III., Fig. 6, § *ibid*, page 176.

† Figured, *ibid*, Plate III., Fig. 8.

‡ Lepidopterological Contributions page 22, from Ann. Lyceum Nat. Hist., of New York, 1886.

darker above than in the typical insect, while the primaries are variegated by a ferruginous brown basal shading, continued narrowly along the internal margin and connecting with a similarly coloured band, extending, on its inner side, parallel with the external margin, but its outer edge starts from the outer margin above the internal angle and runs obliquely inward, so that the band ends in a point before reaching the costa. The upper part of this band, as well as the outer part of the basal shading, has a purplish tint. Fringe dark brown.

I should judge this to be the ordinary ♂ of *L. inornata*, in New York. A single ♀, also raised from these larvæ, fits the description above referred to.

CORRESPONDENCE.

ARZAMA OBLIQUATA.

Dear Sir: In reply to Mr. Moffat and Mr. Kellicott, I wish to say that both of these gentlemen are mistaken in saying that the larvæ of *Arzama obliquata* go to the shore in the fall of the year to stay over the winter. On the 25th of November last my friend, Chas. P. Mackisney, of Arlington, N. J., and I took a walk through the meadows at Arlington, which cover from fifteen to twenty square miles. We did not find any signs of *Arzama* except in one place about two hundred feet square, and there in every reed we cut we found a larva, but we had to cut below the surface of the water to get them. I went out to the meadows again to-day (the 22nd of February) in order to get some larvæ to send to Mr. Moffat and Mr. Kellicott, and I found some about four hundred feet from the shore, where I had to cut the ice to get to the bottom of the reeds. I got four larvæ and shall send them to these gentlemen in order that they may see for themselves that I was right in my statements (C. E., xx., 119). I also wish to state that if they require further evidence I should like them to come to New Jersey, and I will take them to a place where they can get a car load of cat-tail reeds with larvæ in them throughout the whole winter. I do not think that Dr. Riley is correct in saying that the female lays her eggs in masses. I have always found them deposited singly, and I do not think it likely that they would be laid otherwise, because it would be impossible for a number of larvæ to live in one reed.

H. H. BREHME, Newark, New Jersey.

ARZAMA OBLIQUATA.

Dear Sir: On reading Mr. Kellicott's communication in CAN. ENT. for February, 1889, I learn that his observations concerning the habits of *Arzama obliquata* G. & R. larvæ, do not agree with mine. Up to the 26th of January of the present year I held the same opinion as he does, and I was not a little bit surprised on hearing of its being a winter feeder. Requiring some lining for a few packing boxes which I was preparing to send by mail, I had occasion to go to the marsh for some stalks (commonly known as rushes, but by botanists, I suppose, as *Typha*), which make a convenient substitute for cork. The very first stalk that I cut showed that larvæ had been at work. This at once brought to my mind the recent communications of which Mr. Kellicott writes, so I began an investigation and was much surprised at the result. Besides a number of empty pupæ and a mature larva (which I always find in the form of a loop, with one end shorter than the other) at rest for the winter, down in the thick part of the stalk, I found three immature larvæ at full length up in the small part and surrounded by evidence of recent feeding. During my nine or ten years of collecting, I have raised both *Arzama obliquata* and *diffusa* from mature larvæ found on shore in old wood and other rubbish, mostly every year. Some I have found as early as November 3rd, and others in every month until May. Having always found them pretty plentiful on shore, I was of the opinion that it was their habit always to come there to transform, but my observations on the above date convince me that those I had hitherto found were only wanderers, while the main body remain at home to undergo their transformation. As for their being single brooded here I agree with him. I have found two or three moths late in July, but those I should say came from larvæ which passed the winter in the immature state, rather than from eggs laid that season.

March 9th, 1889.

JAMES JOHNSTON, Hamilton, Ont.

NOTES.

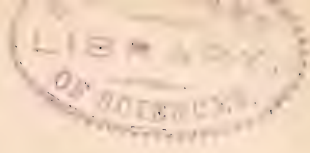
We are glad to learn that Mr. John B. Smith, of the National Museum, Washington, has been appointed State Entomologist of New Jersey. He will enter upon his new duties on the first of April, and will reside at New Brunswick, N. J. While we congratulate the State upon securing the

services of so eminently capable an entomologist, we trust that Mr. Smith will find his new work congenial and satisfactory, and its accessories lucrative and comfortable.

The following amendment has been made to the Agriculture and Arts Act during the recent session of the Ontario Legislature :—"Section 67 of the said Act is amended by adding thereto, after sub-section (2), the following : ' Provided, however, that the Entomological Society of Ontario shall, at its annual meeting, group into five divisions the agricultural divisions enumerated in Schedule A. to this Act, and shall elect one person from each of such five divisions (who shall be a resident of the division he represents) as directors of the said Society.' "

The New York Academy of Sciences is making an effort to erect a suitable monument in Trinity Church-yard in memory of the great ornithologist, John James Audubon. About \$900 has been collected, but the plans accepted call for from \$6,000 to \$10,000. It is earnestly hoped that each scientific society in America will contribute an average amount of \$100 through its members, and thus enable the enterprise to be at once completed. Each subscriber of a dollar or more will receive a copy of a print from Cruickshank's celebrated portrait of the great naturalist suitable for framing. Remittances from our members may be sent to Mr. W. E. Saunders, 240 Central Ave., London ; or to Dr. N. L. Britton, Columbia College, New York.

The following is the list of the officers of the Kent Scientific Institute, of Grand Rapids, Mich., for 1889, which is incorporated for the promotion of scientific education and the establishment and maintenance of a natural history museum :—President, E. S. Holmes ; Vice-President, W. A. Gruson ; Recording Secretary, C. W. Carman ; Corresponding Secretary, E. S. Holmes ; Treasurer, C. A. Whittimore ; Director of the Museum, W. A. Gruson ; Curator, C. W. Carman ; Librarian, E. L. Morely. Board of Directors :—Wright L. Coffinberry, W. A. Gruson, Samuel L. Fuller, E. S. Holmes, J. W. Jones, C. A. Whittimore. Officers of the Board :—Chairman, W. A. Gruson ; Secretary, E. S. Holmes ; Treasurer, C. A. Whittimore.



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LONDON, MAY, 1889.

No. 5.

DESCRIPTION OF THE PREPARATORY STAGES OF ARGE GALATHEA, LINN., WITH NOTES ON CERTAIN SATYRINÆ.

BY W. H. EDWARDS, COALBURGH, W. VA.

(Continued from page 71.)

How then can Mr. Scudder claim that this feeble relic of the tertiaries, stranded, as he tells us, on the loftiest peaks at east and west at the close of the glacial period, unchanged in all respects since that, its imago showing itself but once in two years, the individual living at most but a few days, always in tribulation and peril, saved only from extinction by its acquired habits of dropping into a crevice, or of clinging to the rocks by the feet, its wings of scarcely any use whatever, but a constant source of danger—that this miserable creature stands at the head of its genus, its sub-family, its family, of the American fauna, and in fact of the world, the ideal butterfly !*

The mere statement of the proposition that such a tribe, creepers along the ground, avoiding sun-light, allied to the moths at every stage, often with habit of moths rather than butterflies, have high rank in the order, and that the weakest member of the tribe—the one which has suffered most by isolation and privation—is the highest of all, carries its own refutation.

When a process of reasoning leads to an absurd conclusion, there is a flaw somewhere. The facts may be mistaken, or wrongly presented, and, in either case, the inferences attempted to be drawn from them may be without justification.

Mr. Scudder is compelled to allow, that in three stages out of four, the Satyrinæ are nearer the Hesperidæ and the moths than to other butter-

* We have the expression "the highest butterflies," meaning the Satyrinæ, repeated endlessly, sometimes twice on one page, when "Satyrinæ" would answer every purpose. It seems to me the author of the work, appealing to the reason of his readers, makes a mistake in thrusting his opinions before them so persistently. If the arguments fail to convince, what he calls by one name, will be thought to deserve quite another.

flies, namely: in the egg, larva and pupa. "In certain features, the Satyrinæ show some *curious resemblances* to those of the Hesperidæ. * * * The eggs of the ribbed species *closely resemble* those of the Hesperidæ in general appearance. The caterpillar, at birth, has a *similarly large and striking head*, and occasionally the terminal segments of the body *are armed with much longer cuticular appendages* than elsewhere—a common feature among the Pamphilas; the mature caterpillar is sluggish, with a somewhat flattened belly and short pro-legs, giving a limaciform body, which is clothed with pile only; the chrysalis is *unusually rounded*, and *occasionally is not suspended*," &c.—But. N. E., p. 120. In his "Butterflies," N. Y., 1881, he says:—"It is one of the *most curious features* in the structure of butterflies *that its highest*," and here he means the Satyrinæ, "*and its lowest should resemble each other in so many minor points*. For instance, the *tone and colouring on the wings* of many Satyrinæ, as well as the *position and general nature of the sexual marks on the front pair* (of wings) of some males, find a close counterpart on the wings of some Skippers (Hesperidæ). So also the chrysalids of the Satyrinæ are among *the simplest, most rounded and compact in the whole family, approaching in this respect the lowest butterflies*." That is, not only are there "curious resemblances" in the three stages, but very important ones in the fourth stage. Speaking of the same things in But., N. E., p. 120:—"That these peculiarities have some phyletic meaning it is impossible to doubt;" but what it is, the author does not venture to conjecture. To me the meaning is plain enough. They indicate the close affinity of the Satyrinæ with the "lowest" butterflies. "Nevertheless," we are told, "in all the prime features of their organization, the Satyrs outrank all others." They must be extraordinary features to outweigh all these "curious resemblances," these "peculiarities," with their "phyletic meaning," and to raise the nearest relatives of the Moths to the head of their order. As is natural, the author of these volumes is inclined to make the most of every point that can be construed to tell in favor of his hobby, and to make little of whatever tells the other way. If nothing else can be said, we shall hear that any given case which presents itself obstructively "is entirely explainable as an instance of reversion." In this way are got rid of, or slurred over, some very important facts; thus, "the only case among the higher butterflies" (higher this time means above the Hesperidæ), "where a cocoon, properly

speaking, is made, is in the sub-families most closely allied to the Hesperidæ, among the groups of Parnasinæ and Anthocharinæ." (I very much doubt any cocoon in an Anthocharis, myself); quite ignoring the cocoon of *Semele*, as figured on our plate. "And, again in exceedingly feeble instances, where the necessities appear to be overwhelmingly great, among the higher Nymphalidæ, which have lost even the last remnant of the cocoon of moths, viz., in some of the Satyrinæ, which lack cremastral hooks and undergo their transformations ordinarily in the rudest form of a cell, which they can construct above or at the surface of the ground by the mere movements of the body and the spinning of one or two threads of silk." The "necessities" may have been overwhelmingly great in the case of *Semideca*; but what of *Jutta*, a species of the same genus, living in Maine, and of *Semele* and *Galathea*, at the level of the sea, in temperate Europe! Among the great sub-family Satyrinæ, with its multitude of genera, of nearly all of which the habits at pupation are unknown, it is probable enough that the heterocerous style of pupation is common. To refer such cases, in a group claiming to be farthest removed from the moths, to atavism from the moths, will not do. There are too many of them. And the same sort of ancestral traits crop out in the color and sexual markings of the imago, in the egg and larva, as well as in the pupating habit.

In the "Butterflies" three "prime features," as they are called, are given, viz: The pupating habit, with the flat ventral surface of the pupa among the Nymphalidæ, the papillae on tongue, and the atrophy of the fore legs. In the But. N. E., so far as I see, the papillae prime is dropped, as well it might be. We are told in the former work, p. 255, that this feature consists in the complication of the structure of the papillae of the tongue. In the Papilios and Skippers "these are merely minute tubercles, * * * seldom rising much above the surface. In the Lycænidæ they are longer and more frequent, while in the Satyrinæ they are often half the breadth of the tongue in length, closely crowded together, and often trifid at their tips." (Of course this feature can only be made out by a powerful microscope.) How one of these conditions is an advance on the other is not explained, and I will venture to say is not explainable. Each species of animal, mammal, butterfly, or what not, has a tongue suited to its habits. A cow or a sheep has that organ adapted to grass feeding, a giraffe has one that is half a yard long, and prehensile at that, and feeds off the tree tops; but whoever heard that the

giraffe was exalted because of its tongue, or of the sensitive papillae! If a Lycænid butterfly, expanding half an inch, has papillae on his tongue twice as long in proportion as his great neighbour Papilio, he probably has need of them, and it is pleasant to think he has got them, and is comfortable, and his gastronomic enjoyment big for his size. Surely that "prime feature" does not outweigh the "curious resemblances" spoken of as running through the whole life history.

The resemblance between the pupating habit of the Papilionidæ and the Hesperidæ must be a very obscure and distant one, if, as is stated in B. N. E., 72, it has been observed by no author save Mr. Scudder. The facts have been known from the day of Linnæus to every systematist; but no one has thought of any particular resemblance between the styles of pupating. And now that Mr. Scudder expatiates eloquently upon it, I, for one, fail to see the point. There are attachments of the pupæ that are clear, but they are very different. But allowing all that the author claims, inasmuch as he denies that he has ever said that the Papilionidæ were evolved from the Hesperidæ, one of these modes of attachment cannot have grown out of the other; one is no advance on the other. It is held that both families were evolved out of a "common stock," but what feature that stock had no man can tell.* It may not have been a moth; but the moths and butterflies may both have arisen independently from something else and now unknown. Any resemblance, therefore, whether distant or near, must be charged to the conditions and environment when the types of these families first appeared, and of that we can and shall know nothing. "The necessities" may as well have been "overwhelmingly great" in this case as in the one cited by Mr. Scudder, and being the same for both types, there may have resulted a form of attachment suited to each, and bearing some resemblance. But this involves no relationship. In other words, resemblance is not identity, nor does it imply identity.

As the argument runs, the moths pupate inside a cocoon, with no

* I am informed by Prof. J. A. Lintner that suspension of pupa is very rare among the moths, but that cases occur in which certain members of a family are suspended by the tail alone, and others of same family by both tail and girdle. "In the Geometridæ, the pupa of the Ephyridæ is suspended by the tail, and in some of the species there is also a transverse girdle as in the Papilionidæ." That is a queer state of things if one mode of suspension is more advanced than the other, or than none at all. Among the moths what are called the higher families are not suspended. Some pupate naked, some in cocoons, and neither mode implies rank.

attachment, or with no cocoon, in or on the ground; the Hesperidæ in a folded leaf, or in two or three leaves brought together, having the tail of the pupa attached to the end of the case by a Y-shaped thread, and the body held by another Y-shaped thread (But. 256). The Papilionidæ and Lycænidæ weave "a carpet of silk" by which the hooks of the tail are held fast, and spin a real girdle of many threads, into which they thrust head and anterior segments. But, in the Nymphalidæ, there is no girdle, and the pupa hangs by the tail from the carpet of silk. Finally, as we have seen, many of the Satyrinæ weave no carpet, indeed have no hooks by which the pupa could hang, and so pupate naked in or on the ground, or in some cases, as in *Semele*, in a cocoon. Others that do not make a cocoon, spin threads by which leaves are girdled about them, a style which Mr. Scudder calls a cocoon "by courtesy," as *Erebia Epipsodea* and some examples of *Galathea*. All these last, therefore, behave in the manner of the moths.

Oddly enough, Mr. Scudder has got himself in a state of mind to claim that these unattached pupæ have reached the greatest advance of all. "We see, therefore, a regular progression from the lower to the higher butterflies, in the loss, first, of the cocoon, next, of the girt; and, as if this were not enough, some of the highest butterflies have even lost the last remnant of silk and fallen to the ground." That is to say, a reversion to the habits of the moths is an advance in grade. Continuing: "As if to show that the suspension by the tail alone is a stage beyond that of hanging by tail and girdle, we have a clear proof that all the Suspensi have passed through the stage of the Succincti, since *the straight ventral surface of the abdomen*, assumed perforce by the Succincti when they left the cocoon stage, and became attached to hard surfaces, *still remains in the chrysalids of the Nymphalidæ*" (these italics are Mr. Scudder's), "where it no longer serves any purpose—as clear and striking an indication that the Suspensi outrank the Succincti, as that the pupa is higher than the larva."—But., 258.

I deny the fact alleged, that the pupæ of the Papilionidæ, which being the first to leave the cocoon stage, and "perforce assumed" a flat ventral surface, have that sort of a surface. I never saw such a thing in one of the Papilioninæ; they are all rounded, as in *Turnus*, or rounded and bent back in the middle, as in *Asterias*, *Troilus* and *Philenor*. In many, as the whole of *Turnus* group, the dorsal side is straighter and flatter

than the ventral. Among the Pierinæ, the pupæ of some of *Pieris*, as *Rapæ* and the *Napi* group, have a tolerably flat ventral surface, others of the same genus do not. And *Neophasia*, *Anthocharis*, *Callidryas*, *Terias*, *Colias*, *Nathalis*, all which I know well, have anything but a flat ventral surface. Among the Nymphalinæ, many of the genera have no such surface, as *Argynnis*, all the *Vanessinæ*, *Limenitis*, etc., etc. The *Heliconinæ* do not. And, admittedly, the *Satyrinæ* have pupæ "among the most rounded in the whole family." Moreover, among many of the *Satyrinæ* the dorsal side is as much flattened as the ventral. The supremacy of the *Satyrinæ*, and with them the *Nymphalidæ*, cannot be proved from the shape and conditions of the pupa any more than from the papillae.

The third prime feature consists in the extreme degree of atrophy of the fore legs of the imago. The *Hesperidæ* have six walking, useful legs; the *Papilionidæ* the same number. The *Nymphalidæ*, however, have in both sexes but four walking legs, the first pair being deformed, atrophied, useless for walking, and, so far as is known, for any purpose whatever. It is exactly the sort of phenomenon not very infrequently seen in the genus *Homo*, but here a crippled or atrophied limb has never become a hereditary character. It certainly would not be regarded as a mark of elevation. How atrophy of the legs originated in the butterflies no one can tell, but perhaps by accident in a single member of the type form, and became perpetuated in a family. In the *Lycaenidæ*, we are told, *But.*, 254:—"All the legs of the female are alike, but the front legs of the male are variously aborted." In the *But.*, N. E., 203:—"As soon as we approach the *Lycaenidæ*, we notice signs of an approaching abortion of the fore legs, but only in the male;" described as slight; but is greater in the *Lemoniinæ*. It affects both sexes in the *Nymphalidæ*, but not in one of the sub-families, the *Libytheinæ*. These have six good legs in both sexes. And, in the *Satyrinæ*, the deformity is the most extreme of all. Indeed, unless the front pair of legs should drop off, it is not easy to see what more could be done in that direction. A disfigurement is not generally regarded as a sign of beauty, though tastes do differ. In certain valleys in Switzerland, he who can show the most enormous goitre is the pride of the district. Atrophy of limb, if it prevails throughout a family, may properly be held to be a mark of degradation. It is a phenomenon not confined to any particular order of

insects. There are moths with atrophied wings and legs, carried to a surprising degree; and plenty of instances among the Coleoptera, but few persons would call the loss of essential organs a mark of "aristocratic distinction," as Mr. Scudder does on p. 74, But. N. E. One great family of butterflies is neither fish nor flesh. One sex of a Lycaenid (including the Erycinids) has six useful legs, and is, therefore and thereby a degraded creature, almost, or quite as "low" as a Papilio; but, its mate has its fore-legs always deformed, often utterly crippled, and, therefore and thereby, it is separated from its female, fit company for the "aristocratic" Satyrs! The argument on legs is not tenable. In fact it seems remarkably like nonsense. Deformity can have no ranking value, unless to mark degrees of degradation, and no argument based on the legs of the imago, no matter what their condition, can outweigh that based on every one of the four stages of the insect.

I put the question to a great authority on biology, one whose praises are sounded in both hemispheres, who, moreover, is thoroughly acquainted with Mr. Scudder's argument: "Is atrophy of legs a mark of development?" and the answer came: "Atrophy is not a mark of development." On that rock I stand.

Mr. Scudder's hypothesis of the evolution of these families is obscure, because the language used in different places conveys very different meanings, and, anyway, the hypothesis is peculiar. In But., 244, we read: "Doubtless the Skippers first separated from the common stock; the other families appear to have diverged simultaneously from each other soon after their common separation from the Skippers;" and a diagram presented on page 246 is explained thus: "The position of the main branches and their divisions is supposed to indicate the relative time at which the groups diverged from each other, or from the main stem, and the height which each branch attains the relative perfection of the highest members of that group." In accordance with the author's prepossessions, the stem which is terminated by the *Satyrinæ* is highest of all, in fact six and a-half inches long, evidently limited only by the length of the printed page, and goes straight up from the base (that is, from the "common stock," while the Skippers diverge from the stem at half an inch from the base, and the Papilionidæ and Lycænidæ at another half inch simultaneously, one on one side of the stem, the other on other side. (That is, as if from a setting of hens' eggs were to issue humming birds and eagles.)

The Nymphalidæ begin to branch at an inch and a-quarter above the Papilio, first coming the Libytheinæ; then at another inch the Nymphalidæ, and above them the Satyrinæ, at two and a-half inches. This two and a-half inches "indicates the relative perfection" of the Satyrinæ over the rest of the Nymphalidæ. The "perfection" of the Satyrinæ to the Papilionidæ is as 6.5 is to 1. Truly a parlous elevation for the giddy *Semidea* and its peers! Anyone can draw a diagram, and if I were to use the one made by Mr. Scudder, I should put the Satyrinæ at the first branch above the Skippers, and the Papilioninæ at the top, and the proportion of perfection would be for the latter as 6.5 to 1 of the other. Mr. Scudder assures us that all the Suspensi have been Succincti, and that the evidence "is clear and striking," but his only witness to the fact is discredited. As the moths, in general, have no attachment at all, if the moths are indicated by "the common stock," it is not clear why the Papilionidæ were "perforce" obliged to assume the girdle and button on leaving the main stem. The next stage to no attachment would seem likely to be the single attachment, but whether that was *perforce* assumed we have no means of knowing. It would also seem that the double attachment is the widest departure from the condition of no attachment at all, to be reached after the longest period of time, instead of the shortest. That from no attachment a sudden leap should be made to a double one and then come back to a single one, to culminate in none at all, as it began, is an unreasonable proposition. To me it seems clear that the condition of no attachment found in so many Satyrinæ is closest to the habits of the moths; the single attachment or button comes next, and the double attachment is the final outcome, "showing the perfection of the highest members of the group," namely, the Papilionidæ. Mr. Scudder tells us, and this time we concede the reasonableness of the proposition, that "it is unphilosophical to accord high rank to any group for a single characteristic, especially when, in nearly all its other peculiarities, it evinces its low origin."—But., 250. On this ground the scheme of elevating the Satyrinæ very properly fails.

But, while the diagram cited and the language sometimes used, would give the impression that the author did not intend to make one family evolve from another, other language certainly implies that this did take place, that what are called the higher families all passed through the stages of the lower, and in evolving sloughed off the lower class of habits

more or less completely, till an "aristocratic" perfection was reached in the Satyrinæ. "The Hesperidæ have epiphyses; the Papilioninæ the same; in the closely allied sub-family, Pierinæ, the epiphyses disappear."—But. N. E., 73. "*There is the series, leading from the Hesperidæ in a direct and unbroken course through the Papilioninæ, Pierinæ, Lycæninæ, Lemoniinæ to the Nymphalidæ, and culminating in the Satyrinæ*" p. 74. That can mean nothing else than a sort of fishing pole style of evolution, in which every joint proceeds from and was inclosed in a preceding one. That involves greater difficulty, even than the other plan. The big Papilio is to come out of the little Hesperian, the tiny Lycæna from the big Papilio, the robust and often great Nymphalid from the tiny Lycænid, and the series is to culminate in a weakling Satyrid, aristocratic, if at all, only in the sense of being effète, exhausted, "petered out."

Mr. Scudder insists strongly on the two evident series—one, of the style of pupating; the other, of the condition of the legs. But, what if these series are imaginary? The pupation begins and ends with the moths, and is in a circle, as I have shown, and, therefore, is not in a series. Let us see about legs; first, six good legs; next, slight atrophy in the fore-legs of one sex; then a little farther atrophy; next, six good legs in the Libytheinæ; then complete atrophy in both sexes, and at last extreme atrophy. Using the diagram before referred to, in which "the height which each branch attains, indicates the relative perfection" of the several groups, the whole length of the stem being 6.5 inches; we find the Papilionidæ at 2 inches, the Lycænidæ at 3, the Erycinidæ at 3.25; the Libytheinæ, having six legs, must be rated at 2; the Nymphalinæ 4.25; the Satyrinæ 6.5. This will then run 2, 3, 3.25, 2, 4.25, 6.5. The mathematical name for this sort of series I do not find, but I think it is what is called the illusive—such stuff as dreams are made of. Not substantial enough to base an argument on!

Another thing one would like to have an explanation of. If there ever did arise a tendency towards deformity, and the deformity was a development, why, in the Lycænidæ, it halted at a slight degree, and left all the species of this great family, divided into hundreds of genera, in exactly the same condition? Why it advanced a bit farther in the Erycinidæ and halted, and why both these families have halted for these myriads of years? Why they are not as perfect, in all respects, as the Nymphalidæ, with but four good legs in both sexes—four legs being

the test of perfection? Why, in the Libytheinæ, part of the Nymphalidæ, there are six good legs in both sexes, though they evolved from the tainted Lycenidæ? These little difficulties will thrust themselves into notice when surveying Mr. Scudder's great scheme. It is very odd that the disease we are talking of should have burst out with virulence one step beyond the healthy Libytheinæ, and have swept all before it to the Satyrinæ, who yet have managed somehow to live through the 800,000 years.

There is no trace of butterfly life back of the tertiaries. The formation, next below that, is the cretaceous, adverse to butterfly beginnings. Now, the beginning of the tertiaries is estimated by geologists as somewhere about 800,000 years ago. All of a sudden the shales are full of insects, and we learn by Mr. Scudder's "Fossil Butterflies," 1875, and by his later papers, that the very earliest butterflies, whose remains are found, were closely like what we see to-day, the same families and sub-families, so far as the examples go, which are recognized now. In the Fossil Butterflies, nine species are treated of from the Eocene and Miocene. Of these nine, two belong to the Pierinæ, one to the Parnassinæ, four to the Nymphalidæ, and two to the Hesperidæ. Of the four Nymphalidæ two belong to the Satyrinæ, and one of them is stated to be very close to *Debis* (*Enodia*) *Portlandia* of the United States. The other to be nearly allied to an existing Bornean species. We read, page 83 :—"Our present knowledge places the apparition of butterflies towards the end of the lower tertiaries." It appears then, that on the earliest horizon the "highest" butterflies, as Mr. Scudder esteems them, were living side by side with the "lowest." In the next horizon we find a Hesperid, a Pierid of a genus used in the Butt. N. E., viz., *Pontia*, and a Nymphalid, also belonging to one of Mr. Scudder's genera, *Eugonia*, which he created for *Grapta J. album*. Since 1875, the American tertiaries have yielded seven other butterflies, of as many species. One is a *Pieris* nearly allied to *P. Rapæ*; five are Nymphalinæ, and one is a Libythea; this last is so well preserved that its legs are clearly to be seen, and Mr. Scudder says that "the fore leg is of the same structure as in the genus to-day."—B.N.E., 759. That is, it has six walking legs, though all the rest of the Nymphalidæ have but four. Evidently on the leg classification it is a black sheep, and should be hustled out of the Nymphalidæ. Further, we are told that in one of the Nymphalinæ the legs show that "the atrophy of the fore legs had reached the same

stage which it now possesses."* It appears, then, that while some genera are extinct, others are represented by modern genera very near them, and two belong to genera in use to-day. But the families and sub-families, even to the aberrant Libythea, were as sharply defined as they are to-day. Every family recognized by Mr. Scudder is represented, except the Lycænidae, but their absence is accounted for by reason of "their exceedingly delicate structure and small size;" and it is added, "but there are intimations of the presence of some of their caterpillars in amber," which is a product of the tertiaries. And there is not a species about which there is a doubt as to what family and sub-family it belongs. The neuration of wings, the legs, palpi and antennæ were just as now. It is proved, therefore, so far as there is any evidence at all, that since the Eocene, the families and sub-families of butterflies have not changed an iota. Mr. Scudder is happy in the poetical quotations prefixed to his chapters, and he might have put over the one on fossil butterflies, "Such as creation's dawn beheld, we see thee now." New species have been evolved and new genera, but no new families. Of sub-families we miss *that of the Papilioninae*, whose absence, considering their size and stout texture of wing, and especially if they were among the first to evolve from the "common stock," and, therefore, were always present when any butterfly at all was flying, is remarkable. If they were really the latest to develop, we can understand their absence.

From the beginning of the tertiaries there was a steady advance in the grade of mammals and birds. The supposed ancestors of existing species in these classes are found there, new types manifesting themselves as the period progressed. The families are not those of to-day, but one has developed into many. This very week there is going the rounds of the papers a description of the mammal *Phenacodus-primevus*, an animal both herbivorous and carnivorous, from the Eocene of Dacotah, which Dr. Cope considers the ancestor of the elephant and giraffe, the plantigrades, the carnivora and hooped animals of to-day. But, in the butterflies, there is no evidence of any change whatever.

The hypothesis, advanced by Mr. Scudder, calls for a duration of time which is inadmissible. It is a problem in the Rule of Three; if butter-

* If, as I have supposed, the atrophy of legs originated suddenly and to full extent in the type, and was perpetuated by descent, we can understand why it appears on the earliest horizon; otherwise, not. But if it was a malformation from the first, no degree of perpetuation would change its character.

flies, in the family and sub-family characters, have not changed in 800,000 years, how long time would be required to bring them out of the "common stock" to the grade they had reached in the Eocene? Perhaps the advocates of leg classification can solve it.

Mr. Darwin, in his fourth chapter, gives a diagram explaining his views as to how varieties appeared, and how, from simple variation, genera and families might come to be formed. Starting with several species of a widely distributed genus, which resemble each other in unequal degrees, he represents their offspring by divergent lines—the divergency in each case showing the variation in the descendants of the original species. Many variations appear in one or more of the groups, some of which go but a little way; others flourish, and in their turn give permanent varieties. Some of the original species die out, and, at length, after many thousands of generations, the surviving descendants of the original species are separated into distinct groups of unequal value, and which may be regarded as families and sub-families. The branches, that is, the descendants of the original species, do not evolve one from the other, but are all advancing in their own way, unequally. That kind of evolution is intelligible, at least. One group of butterflies, starting from the "common stock," whatever that may have been, would come to have one manner of pupating, or its bodily organs of a particular pattern; another group a different manner and pattern. The groups are not departing in every respect, or at all equally from the parent form. No matter how far removed in time from the parent, one feature or other may be retained through all the history. Evidently, no such duration of time is required to bring the order of butterflies to their present condition, as is called for by the other scheme treated of. Whether, of the several groups existing at any given period, one were higher in the scale of existence than another, would depend, not on the deformity of a pair of legs, nor the style of pupating, or the papillæ on the tongue, or the presence of a "tibial ephiphysis," but, in the harmonious development of the whole organization. There can be no ascending scale, because one family did not develop out of another, but each separately, and according to the surrounding.* If there is a highest family among the butterflies, as among mammals, the quadrumana,

* There is no evidence whatever that a butterfly sprang from a moth, and it is a fair proposition that all families of the Lepidoptera, diurnal, crepuscular, nocturnal, came from a common parent, and were developing at same time, each in its own way. This calls for vastly less time than the fishing-pole style of evolution.

birds, the thrushes, it is the Papilionidæ, and the Satyrinæ must go to the bottom, carrying the Nymphalinae with them.

This matter of relative rank was discussed by Mr. Alfred Russell Wallace, a man who "sees clear and thinks straight," in 1864, with a treatment worthy his high standing as a naturalist, and the argument then advanced has proved unanswerable. It is based on general principles, and no special pleading from diseased legs, or papillæ, or pupæ will touch it. Indeed, the conclusion reached by Mr. Wallace is so manifestly proper that the test of any other theory on the matter must be whether or no it arrives at the same conclusion. I am glad to be able to quote the argument, as probably it is new to many of the readers of this magazine: "Butterflies and moths are broadly characterised by their diurnal and nocturnal habits respectively, and the Papilionidæ, with their close allies, the Pieridæ, are the most pre-eminently diurnal of butterflies, most of them lovers of sunshine, and not presenting a single crepuscular species. The great group of the Nymphalidæ, on the other hand, contains an entire sub-family (Brassolidæ), and a number of genera, such as *Thaumantis*, *Xeuxidia*, *Pavonia*, etc., of crepuscular habits, while a large proportion of the Satyridæ and many of the Danaidæ are shade-loving butterflies." He then speaks of certain special characters in the Papilionidæ, the most noticeable of which is the tentacle for self defence, in second segment, which every one of the Papilionidæ is provided with: "Such a structural addition to the organization of the family, subserving an important function, seems to me alone sufficient to warrant us in considering the Papilionidæ as the most highly developed of the whole order." He speaks of the "tibial epiphysis," common to the Papilionidæ and some Hesperidæ, which was supposed by some authors to show a direct affinity between the two groups.* These examples, I think, demonstrate that we cannot settle the rank of a group by a consideration of the degree in which certain characters resemble or differ from those in what is admitted to be a lower group; and they also show that the highest group of a class may be more closely connected to one of the lowest than some other groups which have developed laterally, and diverged farthest from the parent type, but which yet, owing to want of balance, or too great specialization in their structure, have never reached

* Here is another character which could not have passed into the Papilionidæ from the Hesperidæ. Whether the "common stock" had it no man can tell.

a high grade of organization. The *Quadrumana* affords a very valuable illustration, because, owing to their undoubted affinity with man, we feel certain that they are really higher than any other order of *Mammalia*, while at the same time they are more distinctly allied to the lowest groups than many others. The case of the *Papilionidæ* seems to me so exactly parallel to this, that, while I admit all the proofs of affinity with the undoubtedly lower groups of *Hesperidæ* and moths. I yet maintain that owing to the complete and even development of every part of their organization, these insects best represent the highest perfection to which the butterfly type has attained, and deserve to be placed at the head in any system of classification."—*Nat. Selection*, 139 et. seq. It is useless to attempt to disparage the value of the characters cited by Mr. Wallace, as Mr. Scudder does in *But. N. E.*, 74; calling them "utterly insufficient," or to say that they indicate low rank, or have no token of high character about them. To those who also can "see clear and think straight" the argument will be satisfactory.

It accords with reason, that if there is to be, in the future, any advance in the development of the butterflies, it will take place among the sun-loving, many-brooded species of the sub-tropical and tropical regions, where the imagos of the collective broods live fully half a year, rather than among the shade-seeking species, which, according to Mr. Scudder, are mostly one brooded, and numbers of which, as we have seen, live but a few days, with adverse surroundings. It is among the *Papilionidæ* that variation, and modification and polymorphism run riot, as both Mr. Wallace and Mr. Bates have related. Even in our own limited fauna, we have two species which are dimorphic and polymorphic. But in the eastern Archipelago, every island has a modified form of certain widely distributed species, and several of these species have from two to four different sorts of female. In particular islands the individuals have changed in shape of wing, in neuration and in color. It is out of this family we may expect that species and genera will be evolved.

I, myself, do not consider the *Pieridæ* as part of the *Papilionidæ*, having been led to that conclusion by study of eggs, larvæ and pupæ of many species of each family. In these stages the differences are as great as can well be. On page 120, *But. N. E.*, Mr. Scudder says of a paper of mine which appeared in this magazine: "The facts brought forward show that the arrangement of the genera commonly adopted in Europe is

altogether unnatural, as one would expect to find it, founded solely upon a few characters drawn from the neururation of the wings," adding, "an excellent opportunity for inaugurating a new and more substantial classification is now open to the general student." Instead of genera, say genera and families. In my view, the Pieridæ form a natural family, the Parnassidæ another. After these come the Erycinidæ and Lycænidæ, then the Nymphalidæ, with Satyrinæ next the Hesperidæ. With this arrangement, the "curious resemblances" noticed by Mr. Scudder in all the four stages of the Satyrinæ to the Hesperidæ puzzle no longer; the "phyletic meaning" is intelligible, and we can admire the fitness of things in general.

ERRATUM.—The word "turned," on page 66, line 13 from top, should read "tumid."

NEW SPECIES OF CANADIAN TENTHREDINIDÆ.

BY W. HAGUE HARRINGTON, OTTAWA.

I. NEMATUS OCREATUS.—♀. Testaceous or honey-yellow; length, 0.35 inch.

Head polished, sutures behind ocelli well defined; ocelli in a slightly curved line with the lower one on the rim of a large shallow basin; face below antennæ whitish, especially a triangular spot at their base; mandibles reddish; a dark impressed point above each antenna, another between them, and one on edge of occiput; antennæ slender, two-thirds as long as body, black with basal joints paler; joints three and four subequal; five shorter.

Thorax with sides of prothorax paler; the meso-thorax darker with a black line on the lateral lobes, and a dark spot within at the base of this line; metathorax with tip of scutellum and post-scutellum and the sutures narrowly black; wings large, hyaline, iridescent; nervures blackish; stigma and anterior border pale; legs unicolorous with body; the extreme tip of posterior tibiæ and their tarsi in part, brown or blackish.

Abdomen stout, slightly longer than head and thorax, uniformly honey-yellow, paler below laterally; basal plates margined with black, and with a dusky spot at side; ovipositor sheaths polished, transparent, plainly showing the large ovipositor; cerci long, black at tips. One specimen captured near Hull, Q., on 16th May, 1886.

2. *HARPIPHORUS VARIPICTUS*.—♀. Length 0.35 inch ; expanse wings 0.80.

Head and thorax black with white markings ; antennæ with terminal joints white ; abdomen and legs rufo-testaceous. Head black, with shallow punctures ; distinct sutures from base of antennæ to vertex ; clypeus truncate ; labrum rounded ; clypeus, mandibles, palpi, entire orbits and posterior angle, triangular spot at base of antennæ, the tips of two basal joints, sixth in part and seven to nine entirely white.

Thorax polished, black ; borders of prothorax, tegulæ, a large spot on flanks, a smaller one over middle coxæ, the scutellum, two short lines on lobes of meso-thorax, the cenchri, the coxæ in larger part, and the trochanters, ivory white ; wings hyaline, with a slight yellowish tinge ; nervures brown, stigma and costa testaceous ; lanceolate cell with straight crossline ; hinder wings with one middle cell. Legs, except ; coxæ and trochanters, rufous ; tips of posterior femora, and a dot on tip of tibia behind, blackish ; inner spur of anterior tibia strongly bifid ; all the claws bifid, rufous.

Abdomen rufo-testaceous above, paler beneath. Captured by Mr. Fletcher, while collecting with me near Hull, 10th June.

This handsome insect is near *varianus* Nort., and *versicolor* Nort., and has also a strong superficial resemblance in size and coloration to *Strongylogaster pallidicornis* Nort. The venation of the anterior wings is peculiar ; the lanceolate cell in each has two short straight cross-lines, which form a small cell near its middle.

3. *PHYMATOCERA NIGRA*.—♀. Robust, shining black ; length 0.20 inch ; breadth of wings 0.45 inch.

Head broad, but not so wide as thorax ; a brief groove above each antenna and each posterior ocellus ; clypeus truncate, labrum edged with white, tips of mandibles rufous ; antennæ as long as head and thorax, slender, gradually tapering to tip ; joints 3 and 4 sub-equal, 5 slightly shorter, remainder of nearly equal length.

Thorax polished ; beneath with very fine short pubescence ; wing-scales white ; median lobe of meso-thorax short, sutures faint, scutellum sparsely punctate ; flat, polished, with two shallow pits at base ; wings hyaline ; nervures brownish, first recurrent received in middle of second sub-marginal cell, second recurrent about one-third from base of third sub-marginal cell, nervure dividing marginals straight ; legs whitish, base of

the anterior and intermediate and most of posterior femora black, tips of tarsi, especially the posterior ones, piceous or blackish.

Abdomen short and stout, with very fine yellowish pubescence, more abundant on terminal segments; ovipositor conspicuous, sheathes black, shining.

Described from five specimens, all ♀, collected in this vicinity. In general appearance it much resembles *Monophadnus medius* Nort., and might be readily mistaken for that species, except for the antennæ. It even more closely resembles a *Blenocampa*, which I take to be *B. paupera* Prov.

4. *MACROPHYA PROPINQUA*.—♀. Black, length 0.5 inch; expanse of wings 1.0 inch.

Head broader than thorax; clypeus emarginate, labrum truncate, both white, line on mandibles white, palpi whitish; antennæ slightly swollen in middle, joint 3 nearly as long as 4 and 5; two indistinct white dots on edge of occiput.

Thorax with slender white line on edge of collar and of wing-scales; meso-thorax polished, moderately punctured and slightly pubescent, median lobe sulcate; scutellum convex, more coarsely punctured and pubescent; a line on anterior and middle coxæ and most of their trochanters, a large spot on posterior coxæ, with trochanters entirely, white; a white line on anterior tibiæ before, extending nearly half way on femora; tarsi with all the joints white, tipped with black, except first joint of posterior, which is black, with a small white dot at extremity without; edge of basal plates white; apical half of wings pale fuliginous; abdomen stout, polished.

Described from two ♀ collected in July. This species is closely allied to *M. tibiator* Nort., but differs in having the posterior tibiæ entirely black.

Var. a, ♀.—Two specimens, also collected near Ottawa, differ in having only the sutures of trochanters white, and in having more black on the tarsi and anterior legs, with a dusky spot on clypeus and labrum.

5. *TAXONUS RUFIPES*.—♂. Black, legs rufous; length 0.35 inch; expanse of wings 0.65 inch.

Head finely punctured, with a fine pubescence, more marked upon the face and basal joints of antennæ; ocelli in a triangle, the lower one at the summit of a bell-shaped shallow depression, the channels at sides

of ocelli terminating behind in a deep puncture ; clypeus short, scarcely emarginate ; palpi piceous ; antennæ long, stout ; joints 3 to 9 sub-equal, terminal joint blunt at apex.

Thorax polished ; tegulæ, with a large angulated spot before on prothorax, pale rufous ; legs rufous, except base of coxæ and tips of some of the joints of tarsi, which are more or less blackish ; wings hyaline, iridescent ; nervures and stigma black, a spot in centre of second sub-marginal cell, lanceolate cell without crossline, two middle cells in posterior wings.

Abdomen long, flattened, sides parallel ; segments 2 to 5 of tergum with the apical margin narrowly pale rufous.

Described from two specimens captured in May.

6. *TENTHREDO SEMICORNIS*.—♂. Black, abdomen and legs partly rufous ; length 0.40 inch ; expanse of wings 0.85 inch.

Head wider than thorax, excavated in front, with a strong ridge above each antenna ; clypeus, labrum and base of mandibles white ; antennæ moderately stout and about as long as the abdomen ; five basal joints black (the third with a narrow rufous ring at base), four terminal joints white, except the extreme apex of last which is black.

Thorax black, except a white spot on flanks, a larger one above the posterior coxæ, and another on lateral margins of the basal plates ; wings hyaline, stigma and nervures blackish ; tegulæ and base of costa rufous ; legs ferrugineous, anterior pair paler ; coxæ and trochanters partly white with base black ; a line on femora above, a spot at apex of tibiæ within, and posterior tarsi, except last joint and base of first, black.

Abdomen black at base and apex ; segments 3 to 6 rufous, margined with black ; ventre rufous except two apical segments.

Described from a single specimen captured in the city on 9th June, 1886, by Mr. J. A. Guignard. This species has the appearance of *rufopediba* Nort., with the antennæ of *grandis* Nort., by which it may be easily recognized.

7. *TENTHREDOPSIS EVANSII*.—♀. Yellow, with black and green markings ; length 0.45 inch ; breadth of wings 0.90 inch.

Head yellow, except an oval black spot surrounding the ocelli, within this black patch are two short yellow lines, one on each side of lower ocellus ; clypeus squarely emarginate, pubescent, as also labrum which is margined with green ; mandible yellow at base, centre green and tip

black, shading to ferrugineous ; palpi greenish ; antennæ black, greenish below ; eyes bronze.

Thorax yellow, paler below ; dorsal surface black ; scutellum and post-scutellum, with four short lines before, yellow ; wings hyaline, lightly obscured in apical half ; nervures almost black, stigma and costa green ; legs variegated ; coxæ, trochanters and femora yellow, the latter with a small black dot at tip within ; tibiæ and tarsi green, with the tip of former and of each joint of latter black ; claws red.

Abdomen yellow, with a broad black dorsal band, uniform in width to terminal segment, when it is rounded and does not quite attain tip ; ventre inclining to ferrugineous, especially the terminal segments.

Described from a specimen collected at Sudbury, Ont., by Mr. John D. Evans.

I have much pleasure in naming this beautiful insect after its captor, who has made large collections at Sudbury, and added much to our knowledge of the fauna of that part of Ontario.

CORRESPONDENCE.

ARZAMA OBLIQUATA.

Dear Sir : Upon my return from London on the 29th March, there was awaiting me, through the kindness of Mr. Brehme, a parcel containing a piece of Typha stalk nine inches long, full of longitudinal burrows, indicative of larval work. In one of these I found a small sized chrysalid and a larval skin. I put the pupa in my hatching box, and the stalk out of the way for the time. On the morning of the 8th of April, sitting in my room looking vacantly at the window, my attention was aroused by observing the outline of a moth at rest on the upright centre sash. Upon close inspection it proved to be a large sized *Arzama obliquata*, in perfect condition. Had Mr. Brehme's chrysalid hatched and the moth escaped from the box? But it seemed quite too large to have come from it. I then looked in the box, and there, resting at the top, was a small sized moth, and the empty pupa case lying on the bottom. I then got the stalk and began a careful investigation, and in the very centre I found a large cavity with a quantity of fine cuttings at the bottom, the empty pupa case of my large moth, and the cast off larval skin. A natural pair at the same time.

Hamilton, April 10th, 1889.

J. ALSTON MOFFAT.

BOOK NOTICE.

INSECTS INJURIOUS TO FRUITS, by William Saunders. Second edition. Philadelphia: J. B. Lippincott Company. 1 vol., 8 vo., pp. 436.

It is with great pleasure that we announce the publication of the second edition of this valuable and important work. That a new issue should be called for is a most satisfactory proof of the excellence and permanent usefulness of the book, and establishes the fact that Prof. Saunders has provided the fruit growers of North America with a standard manual upon the insect enemies they have to contend with. Six years have gone by since the issue of the first edition, and, during that time, great and steadily increasing attention has been given to the study of economic entomology, with the result that many new methods have been discovered for successfully combatting the ravages of noxious insects. The most important and useful of these the author has now embodied in his book, and has done so with very little change in the text of the work. A superficial reader would hardly notice the alterations, but we find that many have been made, and that they bring down the information given to the knowledge of the present day. As an example, we may mention the insertion among the remedies for the codling worm, of the apple and the plum curculio, the recently discovered method of spraying with a mixture of Paris green and water, which has proved so eminently successful. For the information of those of our readers who are not already familiar with the work, we may mention that the insects treated of are grouped under the name of the particular fruit that they attack, and are arranged in order according as they affect the root, trunk, branches, leaves and fruit. An illustrated life history is given of each, followed by an account of the most useful remedies that may be employed, and of any parasitic insects that assist in keeping the pest in check. Twenty of the most important fruits are dealt with, and two hundred and sixty-six noxious insects and a large number of beneficial ones are more or less fully described. The book is beautifully printed on fine paper, and illustrated with four hundred and forty admirable wood cuts. While this work is simply indispensable to the intelligent horticulturist, it is also of great value to the practical entomologist, and a most useful book to place in the hands of beginners. The young collector will find in its pages figures and descriptions of most of the insects that he meets with, and the more advanced student cannot fail to learn from it much that would otherwise escape his observation.

Mailed May 7th.

The Canadian Entomologist.

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No. 6.

CORRECTIONS AND ADDITIONS TO PREVIOUS PAPERS.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

The lapse of time and further observation on some of the things treated of in papers previously published in the ENTOMOLOGIST, render it desirable to make some corrections and additions.

Trogoderma ornata, Vol. XV., 91, and XVI., 37.—The treatment of this pest there detailed so completely annihilated it that it has not been seen since.

Dermestes Frischii, Vol. XVI., 37.—Seems to be successfully naturalized, since it still occurs abundantly on Brigantine Beach, and last September was found at Atlantic City. Mr. Ulke has also taken it at Washington, D. C. (Ulke MS.).

D. murinus, l. c.—This species, if ever imported, is not known to have established itself. There is a form of *D. nubilus* Say, with black or partly black antennæ, and a minimum of fulvous mottling on the thorax; specimens of this kind were probably before Dr. Leconte when he described his *murinus*, Pr. Acad. Nat. Sci. VII., 108; and before Dr. Jayne when writing his "Revision of the Dermestidæ."

Blaps.—The Virginia species of *Blaps*, found very abundantly at Alexandria, is *similis* Latr., as stated by Professor Riley. Another species found in Maryland by Mr. O. Lugger, is *mucronata* Latr. The comparisons and determinations were made by Dr. Horn on his recent trip to Europe.

Ceratocampa regalis, Vol. XVI., 15, 47 and 132.—I have had several favourable opportunities to observe the mode of pupation of the gigantic larvæ of this regal moth. Where it can find ground soft enough to penetrate, it always pupates under the earth, and if at a proper depth the pupa remains there in a clay cell formed around it by its own motions till it discloses in May; but if the larva does not get deep enough the pupa works to the surface and probably does not survive. Should the larva, as is

frequently the case, find no ground soft enough to bore into, it pupates wherever it may be when the change can no longer be deferred, and this occurs mostly under some leaves. Some of these exposed pupæ when collected in April will produce moths, notwithstanding the low temperature to which they must have been subjected.

Pterostichus, Vol. XVI., 73.—I there enumerated sixteen species taken in this vicinity; four others have since been discovered, and three have been transferred from *Evarthrus*, making a total of twenty-three.

P. vinctus Lec.—This species is semi-mountainous, inhabiting under stones on the sides of steep hills where the soil is moist and friable. Though not gregarious, when found several individuals may be taken in the same vicinity. Near the city, it must soon become extinct.

P. unicolor Say.—Of this rare insect I have only taken one specimen, and Mr. W. Klages took another. It must be sought for in mountainous places.

P. lachrymosus Newm.—Occurs with *adoxus*, and in about equal numbers; without care, from their great resemblance, they may easily be confused. Their future must be the same.

P. coracinus Newm.—On the south side of the Ohio, on the rugged sides of the hills yet in a primitive state, this species occurs abundantly. Certain individuals may readily be confused, some with *stygicus* and others with *relictus*, according to the greater or less development of certain characters at the base of the thorax. It is not likely to soon become extinct.

P. tartaricus Say, for form *strenuus* Lec.—Specimens were taken in the city, in June and July, at electric lights, but it did not occur to me elsewhere.

P. patruelis Dej.—This little species inhabits a small swamp, inaccessible, except for a short time during the dry season. It is found about the roots of bunches of grass. When this swamp shall have been drained, this species will probably be extinct here, since no other primitive swamp remains in this vicinity.

P. femoralis Kirby.—Three specimens of this small species were taken once, but the habitat was not observed, though probably it is the swamp mentioned above.

P. Hamiltoni is much more widely distributed than was at first known. It occurs at a distance from the city on the sides of many of the hills in

their primitive state, and I have seen specimens from Maryland, West Virginia and Eastern Ohio.

Atenius, Vol. XVI., 189.—The species mentioned as undescribed has since been described by Dr. Horn under the name *Wenzeli*.

Epitragus arundinis, *ib.*, 190, is found abundantly in August and September, feeding on the pollen of the beech grass growing on the sandy dunes, the underground stems of which probably sustain the larvæ.

Lixus concavus, Vol. XVII., 38.—It is quite possible the bottle of cyanide of potassium, in which this beetle was placed for several days, may have contained no free hydro-cyanic acid, as the cork was airtight ; therefore this proof of the longevity of the beetle is invalid.

Ips fasciatus, *ib.*, 46.—Lately the melanotic forms have occurred here in midsummer about as frequently as the fasciated. The difference in color does not appear to be either seasonal or racial. If a locality exists where either form is alone found it is unknown to me. If *melanism* depends on cold, a latitude or altitude should be reached where there would be only dark forms, and *vice versa*. The color of such of the European forms of *Ips* as I have seen appears to be more constant than in ours. The markings on *I. 4-guttatus* Linn., which appears to be the same as our *fasciatus*, only with a perceptibly finer punctation, are very uniform in the numerous specimens I have seen, consisting of a humeral spot, trilobate in form, and two roundish ones behind the middle of the elytra, either separate or united like dumb-bells, yellowish or reddish. The suggestion of Mr. T. D. A. Cockerell, of Colorado, that humidity may be a potent factor in determining the color in variable species, seems deserving of consideration.

Macrobasis unicolor, *ib.*, 48.—A nursery of young locusts (*Robinia pseud-acaciæ*), growing on a stony knoll surrounded by meadows, was almost defoliated last July by swarms of this beetle. This knoll had probably been used the previous season by the grasshoppers (*Locustide*) of the meadows as the grand depository for their eggs, which were undoubtedly the food of the larvæ of these beetles ; and which, after disclosure, promptly, in their voracity, attacked the nearest *Leguminosa*. This species is usually classed in economic entomology as *noxious*, because it occasionally eats a few beans, etc. ; but it is certainly entitled to rank among the first on the list of *beneficial*, as without its friendly aid it is greatly to be feared the grasshopper would quickly become so numerous as to seriously affect agriculture.

Piazorhinus pictus, *ib.*, 105.—This variable species is fairly abundant here, and is beaten from various bushes, especially oak. In Florida it seems common.

Cicindela, *ib.*, 201.—On Brigantine Beach, N. J., *C. lepida* is sometimes found with *C. hirticollis*. When at rest it is not readily seen on the white sand—its own colour—and rarely moves till in danger of being trampled on, seemingly aware of the protective colour of the sand. A collector has stated to me that where it occurs on dark ground it is exceedingly wary and difficult to capture. With the species of the main land mentioned, occur in abundance, *C. consentanea*, *purpurea* and *punctulata*.

Danaïs archippus, *ib.*, 204.—Very few individuals were seen on Brigantine in 1887 and 1888, and no larvæ of *Anth. polyphemus*, nor of *H. io* were found, though quite abundant other years.

Clotus aphodioides, Vol. XIX., 64.—This species has been the subject of renewed observation, and the former statement of its mode of hibernation must be re-affirmed. Mr. O. Lugger (Proc. Ent. Soc., Washington, V. I., 84) sheds light on its early stages, stating that he has frequently bred these beetles from their eggs, and has found them in all stages, *in situ*, viz., under the bark of dead trees, where they found food in the decaying material: adding, that very likely the specimens found by myself did not enter the holes to hibernate, but rather had made them to leave the place of their birth. The statement of Mr. Lugger is very interesting as to the habits of the larvæ, and it is to be hoped he may make known in greater detail the form of the eggs, larvæ and pupæ, as it is, so far as I know, the only species of the *Scarab. Laparosticti* that is recorded as being lignivorous in the larval state. With decaying wood as the breeding place of the larva, any discrepancy of observation about hibernation may be readily reconciled. Mr. Lugger's timber, under the bark, was probably rotten, and there the larvæ fed, pupated, disclosed, and the beetles hibernated. My timber, under the bark, was sound, and the bark inseparable from the wood, and there was no rotten wood for the larvæ to feed on; but the base of the tree and the subterranean roots would supply this material amply. The beetles, however, could not hibernate there, and so crawled up the tree and into any available hole; this also accounts for the mud on the elytra of many.

Saperda Fayi, Vol. XX., 6.—I have further to state that some of the

larva do not return in the spring of the second year to feed on the dead wood at the entrance of their burrows, but bore on directly up or down the centre of the limb, attaining a distance of from sixteen to twenty-four inches before pupating, in which case the beetle escapes by a round hole.

S. concolor, Vol. XX., 8.—Some of the larvæ of this species, like in *S. Fayi*, bore in the centre of the limb some distance, the beetle escaping by a round hole, which, I think, is cut by itself, as one from which a beetle was crawling appeared to have been newly made.

Dicerca prolongata, Vol. XX., 65.—The statement that this species breeds in conifers, while probably correct, requires more confirmation. It has, however, been ascertained that it breeds in some species of the *Salicaceæ*. Mr. Blanchard records its occurrence in Massachusetts, in June, on the trunks of young poplars and on poplar logs (*Populus tremuloides*). Mr. F. Bowditch took it on the same tree in the Rocky Mountains, and also on a species of willow (*Salix*); while in the mountains of Colorado, Mr. T. D. A. Cockerell took the beetle and probably its larvæ from this same poplar, when splitting it for firewood (Ent. Month. Mag., XXIV., 232).

Myrmophilous Coleoptera, Vol. XX., 161.—The following species must be added to the list:—

Biotus formicarius (Casey, Bull. Cal. Acad. Sci., II., 8).—Occurred at Los Angeles, California. "This interesting species lives in the nests of a small, pale brown ant."—Casey. *Biotus* is a new genus in CTENISTIDES. A figure of the insect accompanies the description.

Ptenidium evanescens Marsh.—This species, according to Matthews, is common in America, Europe, the Canary Islands and Madeira. F. W. Maeklin in his COLEOPT. MYRMECOPHILA FENNICA (No. 102), states that it is often taken, both mature and immature, in the nests of *Formica rufa*, as well as in other situations.

Limulodes paradoxus Matth.—This curious insect is described and figured in Ann. Lyc. Nat. Hist., N. Y., VIII., 409. It was first taken by Dr. Brendell in Florida, and subsequently by Mr. Ulke in New York and the District of Columbia, frequently in the nests of a yellow ant, which Dr. Leconte thought identical with the species with which *Ceophilus monilis* lives. My specimens are from Massachusetts.—Blanchard. Probably not rare. Trichopterygia (Matthews), 157.

Trichopteryx fascicularis Hbst.—Inhabits Europe and North Ameri-

ca, occurring sometimes with ants, but usually in the rejectamenta of stables, and seldom or never in rotten leaves, *l. c.*, 134. This species is a doubtful myrmophile.

Emphylus Americanus Lec. (Bul. U. S. Geol. Surv, Vol. V., No. 3, 513).—Mr. Schwarz took the type of the species in an ant's nest at Veta Pass, Col., at the altitude of 11,500 feet.

Soronia (Amphotis) Ulkei Lec.—Mr. Ulke says of this species:—"I have found it every year, early in spring, in the nests of a small black ant (*Cremastogaster lineolata* Say), and this year I collected them in numbers among *Formica rufa*. The only species in Europe—*Amphotis marginata* Fab., is said to be found on flowers. Erichson found them, however, abundantly in the nests of *Formica fuliginosa*."—Entoml. Amer., III., 78.

Hypocopus formicetorum Mots. (Bull. Mose., 1840).—This species, described from the Kirghis Steppes in Asia, was taken by Mr. Schwarz at Fort Garland, Colorado, in an ant's nest.—*l. cit.*, 503; Class. of the Coleop. of N. Amer., 140.

Myrmexixenis latridioides Crotch. Occurs from Washington southwards, having been introduced with green-house plants.—Class., 140, Trans. Am. Ent. Soc., IV., 363. The habits of this species have not been recorded; but, as the European species live in ants' nests and about green-houses, it is introduced here to direct attention to it as a probable myrmophile.

Euparia castanea Serv. Occurs in Florida, Alabama and Louisiana, in the nests of a small ant (Horn).—Tr., XIV., 87. To be commonly met with in the Southern States in the nests of *Solenopsis Xylini* McC., the stinging ant of the cotton fields.—Amer. Nat., XVI., 784.

Euphoria hirtipes Horn.—This species is stated to have been found in Nebraska by Mr. Lawrence Bruner in the hills of the common red ant. It occurred quite commonly, and the larvæ were found as well as the beetles.—Amer. Nat., XVI., 748. The discovery of the larvæ of this beetle is a matter of so great interest, that the absence of all further account of them is disappointing. Maeklin states that the larvæ of *Cetonia aurata*, a near ally, are so abundant in the nests of *Formica rufa* on sandy shores, that fishermen use them commonly to bait their hooks.

Cremastochilus Knochii Lec.—This species was taken in the spring in ants' nests in Colorado by T. D. A. Cockerell, Custer County (in letter).

Hymenorus rufipes Lec.—The larvæ of this beetle were found abundantly in the nests of *Formica fusca* by Messrs. Pergande and Schwarz near Washington, D. C., and the beetles bred therefrom.—Am. Nat., XVI., 748, and XVII., 1176.

H. obscurus Say.—The larvæ of this beetle were likewise found at the same place in the nests of a large yellow ant, and, from the great care bestowed on them by the ants, it was inferred they were not there by accident.—*Ib.*, XVI., 748.

Mr. F. W. Maeklin published in 1846 his COLEOPTERA MYRMECOPHILA FENNICA, enumerating 136 species. He included such as were known to live with ants habitually; such as were found with them occasionally, but usually elsewhere, and even such as occurred in the vicinity of their nests, if of unknown habits. But the scope of the present catalogue is more limited, as stated in the introduction, and would exclude a large number of those on his list, and among them probably all of the following European-American species:—

Bembidium 4-maculatum Linn.—Dr. Sahlberg took at Ylæne a single individual with *F. rufa*. This species requires no further notice.

Tachyporus brunneus Fab.—Occurred once at Urpala in the society of *F. fuliginosa*. This species is exceedingly abundant here in early spring under stones and chips; sometimes an ant's nest is found under the same stone with the beetle, but I never discovered any connection between them, except the stone.

T. scitulus Er.—Taken not rarely in the nests of *F. rufa*. I only know this species at secondhand, having obtained it from Mr. Dury, of Cincinnati. Its habits in this country have not been noted.

Tachinus pallipes Grav.—Occurred once at Urpala among *F. fuliginosa*. *Pallipes* is very common here, and is simply a scavenger beetle.

Conosoma pubescens Payk.—Found occasionally in the nests of *F. rufa*. This species is abundant here under the bark about the base of dead trees and stumps; as ants also frequently make their nests in the same place, their being often found together is to be expected, but this does not make the species a myrmophile.

Ptenidium evanescens Marsh.—This species I include in my list doubtfully.

Meligethes æneus Fab. (*Brassicæ* Scop.).—Found rarely at Kavantholm in the nests of *F. rufa* by Mannerheim. In our country this species

occurs on the Pacific slope and in the Rocky Mountains, and I am unwilling to admit it in my list without further proof.

Cyphon padi Linn.—Taken rarely in the nests of *F. rufa* at Kavantholm, Kirjola and Urpala. It is not known as a myrmophile in this country.

Otiiorhynchus maurus Gyll.—Maeklin occasionally took this species in the nests of *F. rufa* at Kirjola. In America this species is known to occur only in Greenland, and its habits are entirely unknown.

Leptura, Vol. XXI., 32.—While this article was in press, Dr. Geo. H. Horn published in the Tr. Am. Ent. Soc. a new arrangement of the *Leptura* therein named, based on an examination and study of the types in the British Museum. The form I mentioned as being undescribed turned out to be really *nana*, and now *hematites* is regarded as its varietal synonym. The typical *nana* is thus described:—"Antennæ always piceous; anterior femora and base of middle yellowish, many specimens, however, occur with brown legs, and others with parts of the hind legs yellowish." Except these two the other forms remain as before.

Erratum—Page 33, line 18, read female, instead of male.

ADDITIONS TO THE LIST OF CANADIAN COLEOPTERA.

BY ALVA H. KILMAN, RIDGEWAY, ONT.

By frequent trips to the woods and marshes in spring, to gather and sift the moss for hibernating coleoptera, by minutely examining the debris on the shore of Lake Erie, and by the use of umbrella and sweeping net later in the season, I have added to my collection of beetles, since 1886, several hundred good species. The following list contains those of my captures that do not appear in the lists of Canadian Coleoptera.

The species marked with an * are recorded by W. Hague Harrington in his additions to Canadian Coleoptera, published in Vol. XVI., page 44 of this journal. Those distinguished by two ** are named in Prof. J. T. Bell's list of Staphylinidæ, taken at Belleville, vide Vol. XVII., page 49 of this Journal. All the others, as far as I can learn, are quite new to Canada. For convenience of reference, I attach the numbers found in Henshaw's List of North American Coleoptera:

To Mr. Henry Ulke, of Washington, I am indebted for correct determinations. Dr. John Hamilton, of Allegheny, also kindly assisted me.

Upon such authority, it will be safe to credit the insect fauna of Canada as follows :

- 155—*Elaphrus fuliginosus* Say. Rare, with *Elaphrus Clairvillei* Kirby, hibernating under moss in low woods. March to May.
- 269—**Clivina Americana* Dej. On lake shore.
- 285—*Schizogenius ferrugineus* Putz. Very rare ; one specimen in the sand on lake shore.
- 300—*Nomius pygmæus* Dej. Muskoka. August.
- 372—*Bembidium arcuatum* Lec. Rare in moss.
- 580—*Pterostichus Pennsylvanicus* Lec. Found hibernating in the clay of moss-covered banks in low woods ; not rare. April.
- 741—*Badister reflexus* Lec. Not common in moss.
- 784—*Platynus pusillus* Lec. Rare ; found two specimens on a decayed log. May.
- 792—**Platynus propinquus* G. & H. Rare ; hibernates in decayed wood.
- 1150—*Acupalpus carus* Lec.
- 1165—*Tachycellus Kirbyi* Horn. Common in moss.
- 1186—*Anisodactylus interpunctatus* Kirby.
- 1262—*Desmopachria convexa* Aubé. Not common.
- 1434—*Agabus subfuscatus* Sharp. Rare in clear water.
- 1818—*Scydmaenus mariæ* Lec.
- 1920—*Bryaxis dentata* Say.
- 2096—***Heterothops fumigatus* Lec.
- 2102—*Quedius peregrinus* Grav.
- 2199—*Philonthus æqualis* Horn. Common.
- 2221—*Philonthus nigrutilus*. Quite common.
- 2236—*Actobius nanus* Horn.
- 2237—*Actobius inutilis* Horn.
- 2243—*Actobius sobrinus* Er.

These species of *Actobius* are found in moss on the ground in wet places of the low woods. April and May.

- 2337—*Stenus indigenus* Casey.
- 2364—*Stenus pusio* Casey.
- 2377—*Stenus mammops* Casey.

- 2384—*Stenus egenus* Er.
 2391—*Stenus canaliculatus* Gyll
 2398—*Stenus parallelus* Casey.
 2463—*Stenus punctatus* Er.

The *Steni* are to be found in sphagnum and other mosses at any time of the year, but especially in early spring. The same may be said of nearly all the Staphylinidæ here named.

- 2527—***Lathrobium tenue* Lec.
 2530—***Lathrobium debile* Lec.
 2548—*Scopæus dentiger* Lec.
 2562—***Lithocharis obsoleta* Nordm.
 2675—***Mycetoporus flavicollis* Lec.
 2724—*Bledius nitidicollis* Lec.
 2757—*Oxytelus nitidulus* Grav.
 2948—*Trichopteryx sericans* Heer.
 2978—*Bæocera concolor* Fab.
 2983—*Scaphisoma suturale* Lec.
 3017—*Sacium lunatum* Lec. Found on dead twigs of apple. June.
 3234—*Tritoma festiva* Lac. Three specimens on decaying beech tree. June.
 3235—*Tritoma macra* Lec. Rare ; beaten from decaying tree trunk.
 3244—*Synchita laticollis* Lec. One specimen from dead wood.
 3326—**Læmophleus convexius* Lec. Two on dead apple twigs.

(To be continued.)

CATCHING BUTTERFLIES BY MEANS OF DECOYS.

BY SHELLEY W. DENTON, WELLESLEY, MASS.

It has long been a matter of fact to me, and one which has served a good purpose, and doubtless to other readers of the CAN. ENT., that many butterflies, especially the larger kinds, are attracted by decoys resembling themselves in size and colour.

So many incidents of this nature have crowded themselves upon my notice, that I trust it will not be considered presuming on my part to enumerate a few of them, and at the same time state the benefits to the butterfly hunter which may arise from this source.

My attention was first called to this fact some fifteen years ago, while collecting in the neighborhood of Boston. I caught one day an example of *Papilio turnus*. After taking the insect from my net, and while holding it in my fingers, preparatory to placing in my collecting box, another butterfly of the same kind darted down at the one I held and fluttered above it for a moment, as if to entice it away. I was so surprised that no attempt was made to capture the visitor until he had risen beyond reach. Expanding and placing on a bush close by, the almost lifeless butterfly which I had held in my fingers, and partially concealing myself, I awaited the insect's return; nor was I disappointed or obliged to wait long. I could catch an occasional glimpse through the bushes of my intended victim: nearer it came, till hovering for a moment above my decoy, was easily secured. This plan was followed during the rest of that day, and more or less since that time, with gratifying results; having caught as many as thirty-seven *Papilio turnus* in a day, and that, too, in a place like Eastern Massachusetts, where they are, so far as my experience goes, not very common.

While in Nevada, in the summer of 1887, this method was followed with good success in the capture of *Papilio rutulus*, *eurymedon*, and *daunus*; *Argynnis leto*, *nevadensis*, and *coronis*; *Limenitis lorquini*, and others. I found a piece of bright yellow paper, cut out to resemble *P. rutulus*, proved almost as attractive as a butterfly of that species, and even a yellow leaf, which I picked up and placed in a conspicuous spot, answered the purpose very well once, to enable me to secure a decoy.

I find the best place to expose a decoy is in some sunny nook, where an occasional specimen of the species of which you are in search is seen, allowing the full rays of the sun (provided your decoy is a butterfly) to strike on the expanded wings. It is usually my custom to cut down the green bushes, except, perhaps, one in the centre of the opening, and stripping the leaves from the tallest sprig or branch, place my decoy on the point. The decoy may be a badly damaged specimen—one not fit to preserve.

This method applies best to the larger and stronger flying species of butterflies, and these are the ones the hunter has the greatest difficulty in procuring, especially if the country is rough and broken, so he is restricted in his movements by deep gullies, cliffs, or large, loose rocks. Occasionally the hunter will have an enemy in the shape of a large dragon

fly, which will pounce on the coming prize just as you are about to "scoop" it in; then away the two will go. The butterfly soaring and flapping often till almost out of sight, in the vain endeavour to rid itself of the enemy which has taken such a death-like grip upon it, but this shark of the air is in the end generally victorious.

In some countries, such as Australia and New Guinea--and I speak of these because of personal knowledge--there are large and showy butterflies of very powerful flight, which are almost impossible to catch on the wing, not only being shy, but high-fliers; and I know of no way in which they can be taken so readily as by the method above described. I refer particularly just now to that large and magnificent blue butterfly (*Papilio Joësa*) which in Northern Queensland may be seen alighting on or floating above the tops of the forest trees, occasionally flashing in the sunlight like a star of unusual brilliancy. It is a magnificent sight to a butterfly hunter, and one that will fill him with enthusiasm, but one likely to be of great disappointment should he wait for it to come within reach or settle near the ground, where it could be taken with his net; for nine times out of ten, when it takes flight, it will sail around and away over the tops of the trees till lost from view, unless you have something to catch its eye and cause it to descend from its elevated position. Now, procure one of the same species and place it in a conspicuous place in the sunlight; conceal yourself near by, but be ready to strike at a moment's notice, and await the result. Your decoy will most likely soon be seen (for it is wonderful how quickly a butterfly will discern one of its own kind), and down will come the longed-for prize, to your delight and satisfaction; but you must sweep with your net at just the right time, or the opportunity is lost. But perhaps you ask how is the first specimen or decoy to be obtained? This is often a matter of considerable difficulty. I was accustomed when rambling in the forests of that country to carry a gun, and although when obtained by shooting they were generally in a rather dilapidated condition, yet they served the purpose of a decoy very well.

One thing which has always surprised me, is the remarkable sight and, perhaps, sense of smell which some insects seem to possess. Often while having a decoy exposed, I have been startled by the sudden appearance of a butterfly when none were apparently in the neighborhood. The causes which lead to the attractiveness of decoys no doubt are various. Possibly the passing butterfly on seeing the decoy, supposes the latter

has found an abundance of suitable food. But my opinion is, that in the majority of cases it is a matter of sexual importance, and but for this powerful influence which causes them to seek each other, and thereby propagate their species, these most beautiful objects of nature would eventually die out.

NOTES ON THE PREPARATORY STAGES OF CARTERO- CEPHALUS MANDAN.

BY JAMES FLETCHER, OTTAWA.

Amongst some fertile eggs of butterflies obtained during the past summer by gently pressing the abdomen of ripe females, was one of the above species, the larva of which was carried through four moults up to hibernation. The information gathered is incomplete; but as there is nothing published concerning the preparatory stages of *C. Mandan*, it seems worth recording, if only to assist others who may be fortunate enough to secure eggs of this rare butterfly. Although widely distributed over North America, I know of no locality where it is abundant. Females taken at Nepigon in the Lake Superior district laid eggs in confinement upon common lawn grass (*Poa pratensis*).

The following description is drawn from one specimen only for the last two stages, but from three for the first three stages:—

Egg.—Pale greenish white, hemispherical, broader than high, apparently smooth, but when magnified found to be very faintly and vertically grooved or wrinkled, and densely and uniformly pitted with deep pores which are wide at the mouth and taper to a fine point. Eggs laid 13th July, hatched 23rd.

Larva.—At birth. Length 2.5 mm. Breadth of head, .45 mm.; of body, .35 mm. Length of bristles, .05 mm. Yellowish white, with head and thoracic shield black. Head large and smooth. Body slender, equal. Thoracic shield narrow and bearing a few slender hairs. Body bearing on each side four series of trumpet-shaped bristles. Duration of first stage five days.

From the very first these larvæ were great wanderers, frequently leaving their food plant and crawling all over the glass lamp chimney which was used as a cage. In these wanderings they spun silken paths wherever they went, and to prevent their escape a plug of cotton wadding was

kept in the top of the chimney. This habit of wandering was kept up through all the stages, and the inside of the glass was covered with their silken paths. At no time, however, did they construct a tent by catching several leaves together in the manner of the larvae of *P. Mystic*, *P. Cernes* and *P. Manitoba*. Directly after they hatched, the young larvæ climbed up to the tops of the blades of grass and made a sort of tent by catching the opposite edges together with two or three cords of silk, about half-an-inch below the tip. They then attacked the edges of the leaf, eating down each side and leaving the midrib. When at rest, during the first three stages, they retired beneath their tents and lay extended along the midrib. After the third moult they would sometimes roll the leaf of a wide species of grass, as *Panicum crus-galli*, into a tube similar to those made by *P. Hobomok*. After the fourth moult no tent was made, the larvæ lying exposed on the upper surface of the leaves when at rest.

After First Moult.—Length, 3.5 mm. Head white and furrowed at apex. Thoracic shield black, much smaller than in first stage. Body pale green with two narrow white lines on each side—one sub-dorsal, the other supra-lateral. Spiracles yellowish. Whole body covered with a minute pubescence. Duration of this stage five days.

After Second Moult.—Length, 6.5 mm. Head rather higher than broad, slightly broadest at the base, rounded at apex, and bilobed by reason of a deep frontal groove; mandibles and two clouds on the cheeks, fuscous. Thoracic shield, transparent and hardly discernible. Body pale green and translucent, the dorsal vessel and the ramifications of the tracheæ showing plainly through the transparent skin. There are, on each side, a pale sub-dorsal band with irregular edges, a distinct clear white supra-lateral stripe, and a very faint supra-stigmatal line. The sub-dorsal bands unite on the anterior fold in the anal segment. The supra-lateral stripes at the end of the anal flap. Duration of stage seven days.

After Third Moult.—Length, half an inch. Head lighter in colour, without the fuscous marks on the cheeks. Of the same size as the cylindrical body. Colour more glaucous green than in previous stages. Duration fifteen days.

After Fourth Moult.—Length six-eighths of an inch. Head greenish, tinged with yellow, a little larger than second and last segments, but smaller than the rest of the body. Head squared at the base, rounded at the apex, and deeply grooved down the front. Width at the base and the

height about equal. Surface minutely roughened. Ocelli black, arranged in a semi-circle following the contour of the face, four in front and two on lower side. The third and fourth are twice the size of the others. Mandibles white with black tips. Thoracic shield not distinguishable. Body glaucous green with a pale sub-dorsal band, clearly defined with white above, much paler below, leaving a distinct green dorsal stripe. Supra-lateral stripe conspicuous, creamy white and clearly defined; not so wide as the pale sub-dorsal band. Below this, and half way to the spiracles, is a very pale thread-like supra-stigmatal line. Spiracles white, very inconspicuous on a thread-like line, or perhaps this may only be the tracheæ showing through the skin. On segments three and four (counting the head as No. 1) there appear to be beneath the transparent skin, instead of spiracles, knots of tracheæ. Whole body, including the head, minutely shagreened and covered with small piliferous papillæ, which, on segments two, three and four, are black at the base of the hairs. The segmental folds of the body of the mature larva are as follows:—Segment two, transversely grooved; segment 3, three equal folds; segment 4, four small folds; segments 5 to 11 consist of five folds, the anterior twice the width of the second, which, again, is twice the width of each of the other three; segment 12, three equal folds; segment 13, two small folds and the anal flap.

Some interesting epidermal organs, first observed upon this species, but since found on the larvæ of other Pamphilidæ, as well as on the pupa of *P. Cernes*, (the only pupa I have examined) are some small round chitinous disks, which appear to be trichomes or modified hairs. I form this conclusion from finding that, in one species, there occurred in two instances, instead of these disks, piliferous tubercles; they are rather small and difficult to examine. In the larva of *C. Mandan*, they appear to be saucer-shaped, having a raised edge. In the larva of a species of Pamphila, near to *Manitoba*, they are, in some instances, simple annuli; but, in *P. Cernes* and *P. Mystic*, seem to be rather cone-shaped.

Upon the larva of *C. Mandan*, they are arranged in three lateral series, two of which are complete and occur on all the segments except the head, and the other ventral and incomplete, occurring only on segments five, six and eleven.

The first series is placed above, and anterior to the spiracles, and the disks are sometimes double upon the abdominal segments; but they are not always uniform on the opposite sides of the body. In the specimen

most carefully examined, they were double on segments eight, nine, ten and twelve upon one side, but only on eight and nine on the other, and on segment five there was no disk of this series on one side, but it was present on the other. On segments two, three and four, they are on supra-stigmatal line. On segments five to twelve, below supra-stigmatal line. On segment thirteen on supra-lateral stripe, larger than the others.

The second series is single throughout, posterior to the spiracles, except on segments two, three and four, where they are slightly anterior on the fold above the thoracic feet. The third, ventral, series occurs only on segments five, six and eleven, just beneath the stigmatal fold.

The shape of the larva when mature was different from that of the first stages, the body being largest in the middle and tapering off to each end. The full-grown larva measured one inch and one-eighth on September 12 (twelve days after the last moult). After this, it fed sparingly for about two weeks, and then spun a mat of silk on the face of a blade of grass and drew two other blades over it with single strands of silk. The furrow down the face deepened and appeared to open a little, and I felt sure pupation was going to take place. This, however, was not the case, and two days later the larva left the grass and spun another mat on the sloping side of the lamp chimney. It now ceased to eat, and the colour changed gradually, all the green fading out, and in ten days the body was of a yellowish cream colour with white stripes. This again darkened until the ground colour was a very pale brown or dove colour. The moisture which condensed on the side of the glass kept the lower part of the larva's body constantly wet; but I did not like to risk removing it, as I looked for pupation at any day. After remaining still, and evidently, in hibernation for about five weeks, I found it had fallen from its mat to the ground on 29th October. After about a fortnight discoloured spots began to appear, and I found it was dead. It was at once put into alcohol for preservation and examination.

These larvæ fed freely on all grasses offered to them, but seemed to prefer wide-leaved species; this, however, may have been an instinctive preference for protection, both from the shape of their bodies and the coloration, added to a habit of lying extended down the midrib with the body closely appressed, the lower part of the head protruded, and the apex drawn back, these larvæ are well hidden from observation. The favourite grasses were *Panicum crusgalli*, *P. sanguinale* and *Triticum repens*.

POPULAR AND ECONOMIC ENTOMOLOGY—No. 3.

CUT-WORMS.

BY JAMES FLETCHER, OTTAWA.

Of all the injuries committed year after year upon field and garden crops, none are more annoying than those due to the ravages of the various caterpillars known as Cut-worms. These are the larvæ of dull-coloured, active moths, belonging for the most part to the three genera, *Agrotis*, *Hadena*, and *Mamestra*, and in North America alone constitute an army of no less than 340 different described species, many of which are, at times, very abundant. They may be described, in a general way, as smooth, almost naked, greasy-looking caterpillars, of some dull shade of colour similar to the ground in which they hide during the day. The head is smooth and shining, and sometimes of a different colour from the rest of the body. On the segment next to the head is a smooth plate, known as the thoracic shield, and there are three or four series of bristle-bearing tubercles along the sides. Their habits are nocturnal, that is, they feed at night and lie hid during the day-time. The habits of most cut-worms are as follows:—The eggs are laid in spring, summer, or autumn, and the insects pass the winter either in the perfect moth state, as a half-grown caterpillar, or as a chrysalis. Those which hibernate as moths, lay eggs in the spring and moths are produced in the autumn. The eggs which are laid in summer and autumn hatch soon after, and the caterpillars either become full fed the same season and pass the winter underground in the chrysalis state, or, after feeding for a short time, become torpid, and so pass the winter beneath stones, heaps of dead vegetation, or in cells beneath the surface of the ground. The injury done by the young caterpillars in the summer and autumn is seldom noticed at those seasons, on account of the abundant vegetation; but, in the spring, not only are the caterpillars larger and capable of more mischief, but the land is cleared of all vegetation other than the crop which is to be grown. They are then particularly troublesome in gardens, cutting off young cabbages, tomatoes, and other plants as soon as they are pricked out. When full fed, these caterpillars burrow into the ground to a depth of some inches and turn to brown chrysalids inside a smooth cell or a light

cocoon, Fig. 3. From these, after a few weeks, the perfect moths emerge. They are very active at night, and, when disturbed, have a habit of dropping



FIG. 3—COCOON.

to the ground and remaining perfectly still as if dead, where, from their dull colours, they are difficult to detect. When at rest, their wings lie horizontally over their backs, and the upper ones entirely cover the lower pair. The upper wings are generally crossed with one or more waved lines, and always bear two

characteristic marks—one about half way down the wing, orbicular in shape; the other nearer the tip, reniform or kidney shaped. Fig. 4 shows "The Gothic Dart Moth" (*Agrotis subgothica*, Haw.,) with wings closed and expanded; this is a very common and injurious species, the caterpillar of which is too well known as the "Dingy Cut-worm."

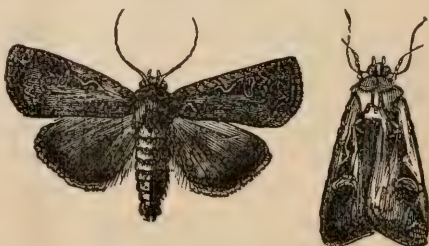


FIG. 4—GOTHIC DART MOTH.

Cut-worms may be divided into three classes, according to their habits, and remedies must be applied in a slightly different manner for each. These classes are:—

1. Climbing Cut-worms, or those which climb trees and destroy the buds.
2. Surface Cut-worms, or those which live on the surface of the ground and cut off herbaceous plants just beneath the surface of the soil.
3. Those which combine both of these habits.



FIG. 5—AMPUTATING BROCADE MOTH.

Of the first class, a good representative is the Climbing Cut-worm (*Agrotis scandens*, Riley). The Dingy Cut-worm, the caterpillar of the Gothic Dart Moth (Fig. 4), belongs to the second class, and the "Variegated Cut-worm" (*Agrotis saucia* Treit.), and the "Yellow-headed Cut-worm," which turns to the "Amputating Brocade Moth"

(*Hadena arctica* Bois.) (Fig. 5) are good representations of the third class.

Remedies.—There are several remedies which may be used for cut-worms. For the climbing kinds, the best remedy is to place round the stem of the tree or bush to be protected, a strip of tin four inches wide, the lower edge can be pressed into the ground, and the tubular shape is easily preserved by securing it above with a piece of twine. This will effectually keep all cut-worms from the tree, for these heavy-bodied caterpillars are unable to crawl over the smooth surface. A similar expedient is to tie a band of cotton batting around the stem, as the caterpillars cannot crawl over this yielding material.

For surface cut-worms the most efficient remedies are the following:—

1. Keeping down all weeds in late summer and autumn, so as to deprive those species which hatch in the autumn of their food supply and winter shelter.

2. Burning off all the stubble and rubbish as late as possible in spring, when many caterpillars and the eggs of some species will be destroyed.

3. Placing some substance with an obnoxious odour around young plants when first set out, as fresh gas-lime, or sand or sawdust saturated with coal oil or carbolic acid.

4. Wrapping. Young plants may be protected in a large measure by simply wrapping a piece of paper around the stems at the time of planting.

5. Tomato cans with the tops and bottoms cut out, placed over the young plants, or strips of tin as suggested for Climbing Cut-worms, will be found to well repay the trouble and expense of procuring them.

6. Kerosene emulsions. Where these caterpillars occur in very large numbers, spraying infested beds with a kerosene emulsion at night has been found very beneficial.

7. Traps. Placing bundles of leaves or grass, poisoned with Paris green, between the rows of infested beds has been found a useful means of destroying large numbers of these pests.

8. Hand picking. When a plant is seen to have been eaten off, of course the cut-worm should always be looked for and destroyed. They will generally be found close to the root and about an inch beneath the surface.

In addition to the above artificial remedies, nature has provided the



FIG. 6—FIERY GROUND BEETLE.

farmer with many useful and active assistants in the shape of various predaceous insects. Conspicuous amongst these are the Ground Beetles, which should be known by sight by every one, so that they may be protected, and not, as is too often the case, destroyed *because they are insects*. At Fig. 6 is shown the "Fiery Ground Beetle" (*Calosoma calidum* Fab.), a common and very useful species. Its colour is deep black with red (or sometimes green) glowing spots. The grub has been styled the "Cut-worm Lion," on account of its useful habit of destroying these pests.

CORRESPONDENCE.

AN EARLY BUTTERFLY.

Dear Sir: While driving in a cutter on 12th March, my attention was attracted to a butterfly fluttering around a farmer's house. Seeing it alight, I attempted to capture it, but although I got near enough to make sure it belonged to the genus *Grapta*, it rapidly flew across a wide field of deep snow and easily eluded pursuit. The weather was mild, and as far as my experience goes, this species is the earliest butterfly to appear in our vicinity; but I consider this particular record as somewhat remarkable even for *Grapta*.

Plover Mills, Ont.

ROBERT ELLIOTT.

CAPTURES AT MONTREAL.

Dear Sir: During the past summer a few butterflies have been taken here which are perhaps worth noting. I took a *Pieris napi oleracea* on May 21, and half a dozen *Pyrameis huntera* and two *P. cardui* one afternoon in September. *Oleracea* is very local and has almost disappeared. *Huntera* is very rare, one or two specimens perhaps being observed each year, and *cardui* has been scarce since 1884, when the species appeared in great abundance. A specimen of *Feniseca Tarquinius* was taken in June and two in July of the previous year (1887). These are the only instances of its occurrence here.

E. C. TRENHOLME, Montreal.

Mailed June 5th.

The Canadian Entomologist.

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THE NOCTUIDÆ OF NORTH AMERICA AND EUROPE.

(First Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

We have seen in several of my previous papers that the Owlet Moths, or *Noctuidæ* of temperate North America, the United States and Canada, resemble most strongly those of Europe. The divergence lies chiefly in the greater number of species belonging to the *Noctuidæ fasciatæ*, or *Catocalinæ*; and this is a tropical feature, such forms becoming more plentiful as we go southward, although *Catocala*, the typical genus of the group, does not seem to cross the equator, to which latter fact I have already called attention. Forms allied to *Pheocyma* (*Homoptera*) and belonging to this group, intrude into the European fauna, on the coasts of the Mediterranean. From the fact that the Southern States reach into the sub-tropics, the mountain chains forming no cross barriers, there is no impediment to the range of southern moths, and a greater number of species and genera of these extend into Canada and the north. The resemblance between the *Noctuineæ*, or *Noctuæ nonfasciatæ* of Europe and North America, can be traced in that the leading European genera are represented with us, and the species are even more numerous. Such leading genera, about which genera of less importance cluster, are *Apatela* (*Acronycta*), *Agrotis*, *Hadena*, *Mamestra*, *Heliothis*, *Eustrotia* (*Erastria*, Tr. non Hübn). The genus *Catocala* has in North America its metropolis, where the number of forms, species and varieties reaches its maximum. The fact that the forms run very close seems to illustrate the observation that in the North-American fauna there exists an evident tendency to the differentiation, or throwing off of species. Instances of this may be cited in the Lepidoptera, in the genera *Argynnis*, *Colias*, *Papilio*, *Hemaris*, *Callimorpha*, *Datana*, *Clisiocampa*, *Scopelosoma*, among many others. As compared with the North-American species of

Catocala, the European are fewer in number and comparatively better marked and distinct, standing farther apart from each other. The hardening process by which each species becomes more isolated in time, seems to have reached a more final stage with the European species of *Catocala*, etc. I have originally compared the European *C. fraxini*, with the North-American *C. relictæ*. I found differences in size and color between the two "representative" species, on the whole so slight as to warrant the belief that the two were derived from a common ancestral stock. We must seek for this ancestral stock in the tertiary, when its range probably extended over Northern or British America, and Siberia. A character which is distinctive of the present European species, is the dull blue median band of the secondaries. Now, I found, and first recorded the fact, that, in certain examples of the American form which has the band white, a faint blue edging to the band was found. This was a reversion to the original color in all probability. The tendency of color to become brighter and lighter in America, owing probably to atmospheric or climatic conditions, is thereby exemplified. The specimens of *C. relictæ*, which have the forewings dusky, are also probably instances of this reversion. A form belonging to this group of the genus has been also described from California. It is doubtful, as yet, whether this can be considered a distinct species. The variation of the North-American forms has led to the publication of a number of names which, in some instances at least, are not properly founded. This "hardening into species" seems to be a natural process by which we may conceive the forms to become gradually more peculiar, different from their surrounding allies. At length the time may arrive when they disappear by extirpation, having given rise themselves to other species, through variation, their species-offspring surviving them.

From a classificatory point of view, the genus *Catocala* can hardly be held as "typical" of the *Noctuæ fasciatæ*, the more geometriform group of the family. Rather is *Pheocyma* (*Homoptera*) to be thus considered; the wings are unicolorous, and the darker rivulous markings extend over both pairs, while the secondaries are more or less exposed in repose. In *Catocala* they are hidden, and Lederer sees no necessity for any sub-family division. Probably the terms are to be used strictly for the convenience of students. The tibiæ are often spinose in these wide-winged genera, and this character, not unusual in the family, the *Catocalinæ* have in com-

mon with the typical group of the *Noctuidæ*, where we see it in *Agrotis*, and a number of separated genera of smaller extent. This spinosity of the tibiæ is not frequent in the *Bombycidæ*, or in the *Geometridæ*; it is not so far apparent in the lowest group of the Owlet Moths, the *Deltoidinæ*. In the *Catocalinæ*, however, the body tends to become untufted and concolorous, the abdomen tapers to the tip, and the resemblance to the *Geometridæ* is further heightened by the looping larvæ.

Either from actual structural characters, or from the peculiar *form*, or as a matter finally of pure convenience for the student, I have divided the *Noctuidæ* into five sub-families: the *Thyatirinae*, the *Noctuidæ*, the *Catocalinæ*, the *Deltoidinæ*, the *Brephinae*. All these grounds for subdivision are recognized by modern systematists. The divisional terms help, as I have elsewhere said, to light up the group to enable us to compare the representation of the family in different quarters of the globe, and to arrive at conclusions relative to distribution and origin. For, on common sense grounds, I object to a classification absolutely technical and rigid; so rigid as to take no note of the plasticity of the forms, and so ignorant of the process by which a spine or a tuft is formed, as to be unable to determine categorically what characters are most difficult, or take more time to be produced in nature. The value of characters for systematic purposes may, therefore, stand in opposition to their biological value. A reasonable entomologist will therefore take note of *all* the facts presented, and will make his categories correspond, so far as possible, with the total qualities of the creatures he proposes to classify. The bare record of structure, and the erection of an artificial nomenclature is the smallest part of a naturalist's work. The thinking mind will discover the bearing of facts upon each other, and educe therefrom the action of natural law.

1.—Sub-family *Thyatirinae*.

With the exception of *Pseudothyatira* and *Leptina* the generic representation of this group, which differs by the position of vein seven of the secondaries, is the same in Europe and North America. The former we may regard as a modification of *Habrosyne*, while the latter seems more removed from the different European generic groups allied to *Bombycia* (*Cymatophora* of Authors non Hübn). North America has one; Europe another, and Japan a third species of *Habrosyne*, so closely allied that they may be considered as geographical or representative species. These

species run much closer together than the species of *Thyatira*; in the size, the characteristic wavy markings, they are nearly alike. Although, the European species of *Thyatira* is sufficiently distinct from *Bombycia* (*Cymatophora*), so that the ground for these genera being placed together is not obvious until we compare the neururation of the secondaries, the American western representatives approach each other more nearly in external characters. Of the two genera, it is *Habrosyne* (*Gonophora*) which is most aberrant, most like the typical Noctuae, most like the genus *Plusia*. And I would here record a most singular fact: older European writers, as Meigen, etc., place *Thyatira* near *Plusia*. Probably the cut of the wing in *derasa*, and the tufts, together with the bright tints of both *batis* and *derasa*, influenced their decision. But there are no special resemblances between the species of *Plusia* and *Thyatira* in the European fauna. Now, in North America, we have two species of *Plusia*, which actually mimic species of *Leptina* and *Thyatira*. The first of these is *Plusia formosa* Gr., which so closely resembles a *Leptina* that, at the commencement of my studies, I described the type under this genus. I had my doubts, owing to the long *Plusia*-like labial palpi, to which I especially alluded. It so happened, that I at once returned the type to Mr. Treat, while I never afterwards saw a specimen, owing in part to the undoubted rarity of the species. I could not myself then subsequently make the correction, which was supplied by the late Mr. Morrison, (who was largely indebted to me for generic and specific determinations in the *Noctuidæ*,) in the Annals of the N. Y. Lyceum of Natural History. The second instance, as its name implies, is the *Plusia thyatiroides* of Guenée, which, in its rosy patches on primaries, reminds one of *T. pudens*. Had these two forms occurred in Europe, they might have strengthened, or of themselves suggested the opinion that *Thyatira* and *Plusia* were allied. As it is, the case is one of the most singular which I have met with in the moths. It is to Hübner that we owe the more correct classification of this group. How much we do owe to this author! This fact alone, and that he has correctly limited the genera, should oblige us to retain Hübner's nomenclature in this sub-family. Writers, who themselves make mistakes in describing structure, should be more modest in their criticisms of Hübner.

The various genera into which the typical European forms are divided by Hübner, are probably valid: *Bombycia*, *Asphalia*, etc. As against

the two European species of *Bombycia*, *or* and *ocularis*, we have two from the west coast, *improvisa* Hy. Ed., and *semicircularis* Gr. But the other European structural types seem to be wanting with us; *Leptina* seems to be quite distinct from these, and an American outgrowth. The species described by Walker from the east, under *Cymatophora*, I have partly examined, and have corrected his generic determination, so that it seems unlikely that we have any eastern representative of the European genera. It would seem to be a proof that the west coast fauna more nearly coincides structurally with the European, that the typical European genus of this sub-family, *Bombycia* (*Cymatophora*), occurs there, and not in the east of North America. There seems to be, finally, some doubt as to what the west coast species of *Habrosyne* really is; whether our eastern *scripta*, which is rather unlikely, or a form identical with the European, which Mr. Hy. Edwards has suggested. While the species of *Pseudothyatira* seems to extend nearly, if not quite, across the Continent, our eastern *T. pudens* Guen. appears to be replaced on the west coast by *T. lorata* Grote. But I have seen no record of this species from California.

We may believe that the peculiar resemblance of the Californian and west coast fauna to that of Europe, has arisen partly in the fact that the preglacial fauna forced downwards during the Ice Age, has been on the west confined to a comparatively narrow strip between the Rocky Mountains and the Pacific Ocean, and that it has been exposed to lesser variation from migration. The temperature and food-plants necessary to many species are contained in narrower belts, with probably more abrupt confines, precluding the range of the species. Thus the original form may have been longer preserved.

I may conclude that this sub-family must be regarded as belonging to the Northern Hemisphere, and its representation in the New and Old World, as derived from a former circumpolar fauna. While certain generic forms found in Europe (at least two in number: the hairy-eyed *Asphalia*, and the naked-eyed genus of which *duplaris* is the type), do not apparently occur in America, we have, as an offset, the species of *Leptina*. We have also, in the more aberrant group of the sub-family, the peculiar genus *Pseudothyatira*, with its one species appearing in two forms, *cymatophoroides* and *expultrix*. On the whole, then, the representation of the *Thyatirinae*, though probably without coincident species, is quite nearly equal in the New and Old World. For, if we have a representative

species of *Thyatira* in the east and another in the west, so Europe has one peculiar species, and, beyond the Ural Mountains, in Siberia, there is found a fourth. All these species differ in size and markings, so that they are readily to be distinguished; while the pattern of ornamentation, pale or pink blotches on the brown primaries, is preserved throughout, perhaps most strongly contrasting in the European *Thyatira batis*, which English collectors call by the pretty name of "Peach Blossom." Our eastern species of *Habrosyne*, *H. scripta*, surpasses, I think, the European *H. dcrasa* in beauty; it was first described from Canadian specimens by the eminent naturalist, the late Mr. Gosse, after whom I have given it the English name of "Gosse's Arches."

A LIST OF THE BUTTERFLIES OF PHILADELPHIA, PA.

BY HENRY SKINNER, M.D., AND E. M. AARON.

Appreciating the value to students in geographical distribution of faunal lists of a given region, with notes thereon, and the interest that such lists have for beginners in the same field in after years, we have concluded to publish here a list of the DIURNAL LEPIDOPTERA known to us to have been taken in the vicinity of Philadelphia. A circle drawn around the new City Hall, with a radius of ten miles, is the line of limit to the "vicinity" here treated of.

We wish to disclaim any intention to enter into the question of synonymy in this paper, and have, therefore, implicitly followed the catalogue of Mr. W. H. Edwards, edition of 1884, as being the most complete and at the same time the most accessible to students. The collections of the Academy of Natural Sciences of Philadelphia, of the American Entomological Society, and of Messrs. Peale*, Ridings*, Wilt*, Blake, Laurent, Johnson, Keen, Bartholomew, *et al*, have been looked through by one or both of us, or their owners have been consulted as to their captures in this locality. Very few of the species here enumerated are unknown to us personally as natives of this region.

To this we have added a brief list of species heretofore accredited to this region on what seem to us to be doubtful or insufficient grounds.

* Now in the possession of the American Entomol. Soc.

A few hitherto undescribed varieties have been given names, as we believe that any form sufficiently distinct to merit a characterization is worthy a distinguishing name. Such action, in our opinion, is in the interests of the science. A variety unnamed, or only indicated by a number or a letter of the alphabet, is much more likely to be ignored and subsequently redescribed than if it is at once elevated to the dignity of a recognizable name. *Papilio asterias*, var. *alunata*, is more likely to be respected than *P. asterias*, var. A.

Papilio ajax.—This species is said to have been found here in some numbers in past years. In a collecting experience of twelve years we have seen but three specimens. Pawpaw, its food plant, is scarce in this region. Nearly thirty years ago Mr. Newman reported rearing it in some numbers from the chrysalis.

Papilio philenor.—Occasionally common, but as a rule very few specimens are to be taken. During the season of 1888 a colony of larvæ was found here on the moon-vine (*Ipomœa bonet-nox*), a cultivated plant which is grown to a considerable extent in West Philadelphia. Most of these were infested by parasites, which, at this writing, have not emerged from their chrysalids. A feature of the unusually warm weather of the past winter was the finding of a perfect ♀ *Philenor* flying in Logan Square, opposite the Academy of Natural Sciences, on February 26th.

Papilio asterias.—Common and very variable. One very interesting variation we think worthy of description.

P. asterias, var. ♀, *alunata*, nov. var.—Type, American Entomological Society. Expands four inches; emarginations faint and nearly white; primaries apically produced, with but four sub-marginal spots, each one growing fainter as the last one in the lower disco-cellular nervule is reached; the spot between 1st and 2nd sub-costal nervures is faint; in the marginal row the spots are smaller and rounder. Secondaries: marginal lunules indicated very faintly, the blue between the nervures bright and well marked; no yellow spots internal to the blue, except the one at the apex, which is much smaller than the normal. Beneath: primaries as above, the orange spots usual in lower half of the sub-marginal row wanting. Secondaries with the sub-marginal row of orange spots very much smaller than in the typical form. No spot in the cell. In the collection of Dr. Skinner there is a striking specimen which differs from

the type of *alunata* in that the lunate spots on the secondaries are normal except in colour, which is the same as those in *P. troilus*. The submarginal row of spots on the primaries is wanting, the first one very faintly indicated. In other respects it does not differ from *alunata*. Although the type specimen of *alunata* has no locality label on it, we have good reason to believe it to be from this region. The specimen in Dr. Skinner's collection was taken in Fairmount Park.

Papilio troilus.—Common.

Papilio turnus.—Common. Philadelphia seems to be about the latitude where the yellow and black (*glaucus*) females are found in equal numbers, and consequently, as is to be expected, interesting gradational forms have been taken here. A number of specimens of ochraceous females have been taken. One remarkable specimen was captured by Dr. W. L. Abbott at Chestnut Hill, and is now in the collection of Dr. Herman Strecker, of Reading. Perhaps the best way to convey a correct impression of its appearance is to say that were a black ♀ to be pasted over a yellow ♀ and the black then torn off in irregular shreds leaving the yellow to show from below, the specimen so treated would closely resemble this very striking form. The lines where the black and yellow join, while irregular, are abrupt. There is no flaking or commingling of the two colours. Another specimen, which, like the above, is believed to be unique, instead of being bi-laterally divided like those figured on plate 5, of Vol. II., of "Butterflies of North America," by Mr. W. H. Edwards, is divided antero-posteriorly. The primaries were *glaucus*, and the secondaries normal *turnus*. This specimen is also in the collection of Dr. Strecker.

Papilio cresphontes.—Occasionally taken. A fine pair have been seen in Fairmount Park, and several have been taken near Angora.

Pieris protodice.—*Pieris rapæ* seems to have pretty well supplanted the indigenous species *protodice*, the latter having been much more common some years ago. At the present time it may be said to be one of the rarer species. At Gloucester its food plant has been observed to be the common pepper-grass (*Lepidium Virginicum*).

Pieris rapæ.—Painfully common. A number of specimens of a marked varietal form have been taken. They may be known as follows:—

Pieris rapæ, var. *immaculata*, nov. var.—Same size and form as the

parent form, from which it differs in that it has no spots on the upper or under side of the primaries. Described from five specimens in the collections of Am. Ent. Soc., Dr. Skinner and E. M. Aaron.

Anthocharis genutia.—Rare. While this species has been taken at Westville, N. J., five miles below Camden, by Messrs. Newman, Wilt and Johnson at three or four different times in the past twenty years, we have searched for it unsuccessfully for a number of seasons past, in April and May, and have not succeeded until this season (May 6th) in capturing it—two female specimens. These we found flying over banks on which the white-flowered *Cerastium arvense* grew thickly. The food plant, *Sisymbrium thalianum*, though usually not common, is found there in considerable quantities. The locality is directly on the red clay banks of the Delaware, just west of Westville, at the point where the large shad nets are hauled in.

Callidryas cubule.—Exceedingly rare. Two or three specimens only are known to have been taken. It is, however, common in the pine barrens of South Jersey.

Colias eurytheme.—Very rare. The form *Keewaydin* has been taken in a few instances.

Colias philodice.—Common.

Terias nicippe.—Rare at Philadelphia, more plentiful below Camden, N. J. The food plants, species of *Cassia*, are not common in this locality.

Terias lisa.—Moderately common, but very local. Feeds on false sensitive plant (*Cassia nictitans*).

Danias archippus.—Common. The caterpillar is usually infested with a dipterous larva, perhaps *Mascicera archippivora*. In some cases not one of a large number of caterpillars reaches the imago state.

Agraulis vanille.—Exceedingly rare. Probably only an occasional visitant. It is possible that it has been brought here in one of its early stages on its commonest southern food plant, *Passiflora incarnata*.

Argynnis idalia.—Plentiful some years; usually rare. On page 543 of his "Butterflies of the Eastern United States," Mr. Scudder states that "the female generally flies a little faster than one can walk hurriedly. The ample wings are flapped with great vigor, but do not seem adapted

to swift flight." Dr. Skinner, in CANADIAN ENTOMOLOGIST, Vol. XIV., page 20, has already pointed out, that in this region the flight of the female "is exceedingly rapid, and generally in a straight line for about one hundred feet; then they do not alight on a flower or a bush, or flutter about like the male, but suddenly drop like lead in the long grass. It would be almost impossible to tell the exact spot where they alight, as they drop so suddenly, but on approach near it they are off like a shot again." Our observation, and that of a number of competent observers, consulted by us, substantiate the accuracy of the latter description of the habits of the female. It is more especially true of fresh females, which are being sought by the males.

Argynnis cybele.—Common. Mr. Scudder, on page 560, says:—"The eggs are laid upon the leaves and stalks of the food plant, and not, as stated by H. Skinner, dropped from a distance upon the herbage." Dr. Skinner did not say or infer that this is the invariable habit of the insect, but simply recorded a single observation with the following comment:—"It remains to be seen whether this species always drops its eggs from a height, or only behaves in the peculiar manner occasionally while ovipositing." On page 562, Mr. Scudder asks:—"Is it possible that the female ever deposits by hovering in the air as Mr. Skinner reports?" Affirmative testimony, such as Dr. Skinner has given, is certainly, in a case of this kind, of greater value than any amount of negative testimony, and it should be added that Mr. G. H. Parker, now Instructor in Zoology in Harvard College, was present and also observed the actions of the female *cybele*, described by Dr. Skinner. Messrs. E. M. and S. F. Aaron have both also observed the same thing.*

Argynnis aphrodite.—Very rare.

Argynnis myrina.—Common in restricted localities. In the Proceedings of the Entomological Section of the Academy of Natural Sciences of Philadelphia, 1887, page 5, Dr. Skinner has described an interesting variation of both sexes of this species, found in Fairmount Park. These specimens are in the collection of Dr. Strecker.

* Since the above was written the authors have been favored with an opportunity at Westville, N. J., of observing *Argynnis myrina* following this same strange course in ovipositing. During this season also Mr. Aaron has detected *A. bellona* in the same habit, and he is strongly of the opinion that strange motions frequently observed in *A. diana* in Tennessee are to be accounted for in the same way, though at the times of observation they seemed quite unaccountable.

Argynnis bellona.—Never very common.

Euptoieta claudia.—Rare.

Melitæa phæton.—Rare ; very local.

Phyciodes nysteis.—Very rare.

Phyciodes tharos.—Common in its various forms.

Phyciodes Batesii.—Reported to have been not rare in this locality twenty years ago. Tryon Reakirt described it from types found at Gloucester, N. J. We are not aware of its capture of late years, except in two examples.

Grapta interrogationis.—Moderately common.

Grapta comma.—Not common.

Vanessa Antiopa.—Common.

Vanessa Milberti.—Exceedingly rare. Only two or three specimens known to have been taken here.

Pyrameis atalanta.—Very common. In this locality *Atalanta* generally feeds on false nettle, *Boehmeria cylindrica*.

Pyrameis Huntera.—Very common. Mr. E. M. Aaron has observed a female laying her eggs on the Canada Thistle (*Cirsium Arvense*), in Fairmount Park.

(To be continued.)

THE ENTOMOLOGICAL CLUB OF THE A. A. A. S.

The annual meeting of the Club will be held at Toronto in the room of Section F., University of Toronto Building, beginning at 9 a. m. on Wednesday, August 28th. Members of the Club are requested to register at once upon arrival and obtain the Club badge. Those who intend to contribute papers are requested to send the titles to the President, Mr. James Fletcher, Government Experimental Farm, Ottawa, Ontario, or to the Secretary, Dr. D. S. Kellicott, Buffalo, N. Y. It is expected that there will be a large attendance and an especially interesting series of meetings.

The annual meeting of the Entomological Society of Ontario will be held at London during the following week. It is to be hoped that many of our visiting entomologists and associates will be present.

DROVES OF LYCÆNID CATERPILLARS HERDED BY ANTS.

BY MRS. WYLLY, OF INDIA.*

The larvæ of *Tarucus theophrastus* Fabricus are cultivated and protected by the large, common black ants of Indian gardens and houses. The caterpillar, which varies in colour from light pure green to a dark reddish tint [this is a common variation in Lycænid larvæ], is about three-quarters of an inch long, louse-like in shape, and slow in movement, and it feeds on the *Zizyphus jujuba*, a small, thorny bush of the jungles with an edible, astringent, yellowish fruit, the "Byr-coolie" of the natives. Some Lycænidæ larvæ have the power of protruding and retracting at will two small, fleshy tentacles or horns, each tufted with a brush of fine hairs, from the upper surface of the tail segments. Between [on the next segment anteriorly] these tentacles is a small slit, from which they exude a small drop of a juice of some sort eagerly sought by the ants, and which they can generally procure by stroking the larvæ gently with their antennæ. The ants set up what appears to be merely a temporary nest at the foot of the tree, the better to carry on their operations. Just before the rains set in, about the middle of June, great activity among the inhabitants of a *Zizyphus* tree may be observed. The ants are busy all day long running along the branches and leaves in search of the larvæ, and without fail an ant will come to one full-grown, and meditating on the choice of a snug retreat [in which to turn to a pupa]. A friend or two turning up, the ants set to work to guide and drive their caterpillar in the direction they wish him to go, *i. e.*, down the stem of the tree towards their nest. This is not always an easy business if the prisoner is refractory and would prefer going somewhere else; but as a rule they are docile and easily led. Having kept guard over him until they get him safely into his proper berth in the row, and he has accepted their ultimatum as final, he drops off into a preliminary doze and undergoes his transformation into a pupa. If you gently scrape away the loose earth piled up at the base of the tree you will see some hundreds of larvæ and pupæ in all stages of development arranged in a broad even band all round the trunk and lightly covered with earth. The ants object to their being uncovered, and will immediately set to work to re-cover them, and if you persist,

* Reprinted from an article entitled Butterflies and Ants, by Lionel de Niceville, F.E.S., in the Journal of the Bombay Natural History Society, Vol. III., p. 164 (1888).

they will remove all the chrysalids and bury them lower down. When the butterfly is ready to emerge, which is in about six or seven days, it is tenderly assisted to disengage itself from its shell, and should it be strong and healthy, it is left undisturbed to spread and strengthen its wings and fly away. But if, by any mischance, it emerges deformed and too crippled to use its wings, a catastrophe occurs. In one case, a butterfly had fallen to the ground before its opening wings had dried, and one of the soldier-ants tried to rescue it. He carried it back to the tree with the utmost care, and made several attempts to assist the butterfly to hold on again. Finding his efforts unavailing, he left the cripple for a short time to recover itself. On his return, seeing no improvement, he appeared to lose patience, and, rushing in, bit off both the deformed wings at the base, and carried off the wingless body into the nest below, whether as food for the community or for what other purpose I was unable to ascertain. That was the only occasion on which I ever saw any high-handedness on the part of the ants, though their usual ill-temper requires no very close observation to detect.

It is a curious sight to watch the fragile and delicate newborn butterflies wandering about, all feeble and helpless, amongst the busy crowd of coarse, black ants, and rubbing shoulders in perfect safety with the ordinary fierce big-headed soldiers; as odd a contrast as the fresh creamy whiteness of the opening wing, the flash of purple and blue, and the sparkle of green and silver eyes is to the darkness and dinginess of their queer home. For some time after the butterflies have gained strength to fly away, they remain hovering over the nest. A larva of a species of *Catopsilia* [one of the *Pierinæ*, or "Whites,"] I threw down as an experiment, was immediately set upon and torn to pieces in a second by the ants.

I took a *T. theophrastus* larva from a tree, and introduced it on the pathway of another company of the same species of ants who lived in our verandah, but kept no "farm," and it was odd to see the ants come tumbling out headlong to fight the intruder, and the sudden way they cooled down on investigation of the foe; none attempted to harm him, and he was politely escorted across their boundary, the ants running alongside, and feeling him all over with their antennæ. This must have been instinct, as they could have no former knowledge of him as a "milk-giver." The dead chrysalids in an ants' nest are carefully removed and thrown away outside; the ants also distinguish between the dead and living.

ADDITIONS TO THE LIST OF CANADIAN COLEOPTERA.

BY ALVA H. KILMAN, RIDGEWAY, ONT.

(Continued from page 110.)

- 3443—*Trogoderma tarsale* Melsh. Not rare.
- 3683—*Carpophilus antiquus* Melsh. Rare ; under bark of dead maple and beech.
- 3686—*Colastus maculatus* Er. Rare ; took three or four from the stump of a maple tree, cut while the sap was running.
- 3712—*Eupuræa peltoides* Horn.
- 3753—*Cryptarcha strigata* Fab.
- 3823—*Corticaria pumila* Lec.
- 3871—*Bactridium striolatum* Reit.
- By placing chips on the top of fresh-cut stumps of maple, oak and other trees, and turning them from time to time, these last-named species are found. Attracted by the flowing sap, they hide under the chips and may be taken along with the more common species of *Nitidulidæ*, *Trogositidæ*, etc., in considerable numbers.
- 3987—*Ptilodactyla angustata* Horn. Swept from weeds. June. Not common.
- 3992—*Eucinctus morio* Lec. Swept from bushes. Muskoka. August.
- 4015—**Cyphon collaris* Guér. Rare ; beaten from wild gooseberry.
- 4031—*Dromæolus basalis* Lec.
- 4038—*Dromæolus striatus* Lec.
- These species, a few specimens of each, were got by beating. I have no record of the plant.
- 4097—*Cardiophorus convexus* Say. Not common on conifers.
- 4217—*Elater pedalis* Germ. Several taken in sweeping net.
- 4228—*Elater socer* Lec. Rare ; found two under bark.
- 4229—*Elater rubricollis* Hbst. One by beating in July.
- Elater ? macilentus* Rand. One taken on beech. June.
- 4290—**Agriotes oblongicollis* Melsh. "
- 4305—*Melanotus longulus* Lec.
- 4335—*Melanotus tenax* Say. Taken occasionally by beating shrubbery. June and July.
- 4439—*Corymbites fulvipes* Bland. Rare on beech and maple. June.
- 4475—**Corymbites fallax* Say. Occasionally on thorn.

- 4494—*Corymbites aratus* Lec. Two specimens on lake shore.
- 4542—*Drapetes geminatus* Say. I find these pretty little beetles in a certain locality each year on elder blossoms.
- 4666—*Actenodes acornis* Say. Rare; one specimen on oak.
- 4767—*Rhyncheros sanguinipennis* Say. Found one flying in a pine grove. Mr. Jas. White also got one on pine.
- 4820—*Pyropyga decipiens* Harr. Not rare; on beech and other foliage. June.
- 4911—*Podabrus corneus* Lec. One specimen; no record.
- 5177—*Clerus nigriventris* Lec. Quite abundant on pine brush. July and August.
- 5229—*Laricobius Erichsoni* Rosen. Taken on pine in May; quite common. This is the *L. rubidus* of the Toronto list and of Canadian collections.
- 5243—*Ptinus bimaculatus* Melsh. Three years ago I found one specimen crawling around in a cork-lined box used for duplicates. As I could not discover that my duplicates were infested, I did not overhaul the box. The following summer, June, 1887, I found two or three specimens of this interesting beetle in the same box. Since then I have kept it as a breeding place for this species, and in May, 1888, found several more specimens therein. I have no recollection of having ever placed in the box anything but Canadian beetles, and thus introduced it from abroad. The beetles submitted as food for the larvæ bear evidences of having been used as designed. Packard says that the commoner species, *Ptinus fur* Linn., is known to attack collections of insects.
- 5251—*Ernobius granulatus* Lec.
- 5254—*Ernobius luteipennis* Lec. Both rare on pine. June.
- 5289—*Vrilletta convexa* Lec. One specimen taken while beating. Mr. Ulke says:—"This is a California species; never before saw it east."
- 5339—*Sinoxylon basilaris* Say. Rare.
- 5404—*Ennearthron thoracicorne* Zeigl.
- 5408—*Odontosphindus denticollis* Lec. Rare; swept from shrubbery.
- 5459a—*Onthophagus Orpheus* Panz. One specimen flying. August.
- 6011—**Callidium cereum* Newm. Two taken at Ridgeway on pine, one at Edmonton by Mr. White, and one at Hamilton by Mr. Johnston.

- 6090—*Phyton pallidum* Say. I took a pair of these handsome little Longicorns on wilted leaves of red oak (*Quercus rubra*) July 12, 1887. It is rare indeed.
- 6183a—*Xylotrechus lunulatus* Kirby. Not common on hickory.
- 6209—**Microclytus gazellula* Hald. Several taken by Mr. Moffat at Hamilton. Three were taken here on hickory.
- 6609—*Bassareus detritus* Oliv. Several swept from foliage.
- 6671—*Pachybrachys trinitatus* Melsh. Not common; taken by sweeping with net, but I cannot say upon what plant.
- 6945b—*Oedionychis limbalis* Melsh. Beaten from leaves of ash and linden.
- 7003—*Systema blanda* Melsh. Rarely found in moss. March.
- 7534—*Hypophloeus tenuis* Lec. Not rare under bark of stumps.
- 7693—*Canifa pusilla* Hald. Quite common in fungi.
- 7698—*Nothus varians* Lec. Not common in crevices of bark on dead trees.
- 7840—*Mordellistena convicta* Lec. Found occasionally on thorn blossoms.
- 7900—*Xylophilus nebulosus* Lec. Taken while sweeping; rare.
- 7967—*Anthicus spretus* Lec. Not rare; by sweeping in wet places.
- 8364—*Apion erythrocerum* Smith.
- 8371—*Apion impunctistriatum* Smith.
These were found in moss in spring.
- 8427—*Phytonomus punctatus* Fab. Common on lake shore and in meadows. June to September.
- 8429—*Phytonomus setigerus* Lec. A pair taken by Mr. Jas. White, of Edmonton, Ont., on the sand near some stream or pond.
- 8440—*Listronotus sordidus* Gyll. Rare; on lake shore.
- 8567—*Onychylis nigrirostris* Boh. Occasionally found on the shore.
- 8575—*Endalus ovalis* Lec. Swept in numbers from the grass growing on the margin of a pond in the woods. August.
- 8582—*Lissorhoptus simplex* Say. Common on the petals of the yellow pond-lily.
- 8607—**Otidocephalus Chevrolatii* Horn. Not rare on leaves of elm, etc.
- 8611—*Magdalis perforata* Horn.
- 8690—*Thysanocnemis helvolus* Lec. One specimen from foliage of hickory, July 26; this is a rare species.
- 8753—*Acamptus rigidus* Lec. Not common on lake shore.
- 8786—*Cryptorhynchus parochus* Hbst.

8788—*Cryptorhynchus pumilus* Boh.

8795—*Cryptorhynchus fallax* Lec.

These kinds I find occasionally on the bark of dead linden, etc.

8820—**Acoptus suturalis* Lec. Quite common on hickory. June and July.

8834—*Caeliodes flavicaudis* Boh. Rare; swept from smart weed (*P. persicaria*).

8893—*Pseudobaris t-signum* Boh.

9071—*Pityophthorus cariniceps* Lec.

9223—*Brachytarsus alternatus* Say.

These three species I have taken rarely while sweeping.

PREPARATORY STAGES OF EUPLEXIA LUCIPARA, LINN.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

EGG.—Nearly spherical, flattened at the base, marked with about twenty-five longitudinal ribs and numerous transverse ridges, the former somewhat irregular and running to a depression on the summit; color whitish, with a circle around the middle and a spot on top of purplish-brown; these marks more or less confluent. Length about .5 m.m.

NEWLY-HATCHED LARVA.—Walks in the manner of a geometer, not using the central abdominal legs. It is of a whitish colour, with many black dots, from each of which arises a hair. Head, thoracic legs, and cervical spot, black. Duration of this stage about four days. When not feeding, the insect remains stretched out at full length on the back of a leaf.

AFTER FIRST MOULT.—Semi-transparent, whitish, with fine black dots as in the previous stage, a transverse row to each segment. Head whitish, mouth-parts black. Duration of this stage four days.

AFTER SECOND MOULT.—Differs from the preceding only in size. Duration, five days.

AFTER THIRD MOULT.—Whitish, a blackish lateral band with traces of dorsal and sub dorsal lines on first three segments. Black piliferous dots. Duration, six days.

AFTER FOURTH MOULT.—Much the same. The twelfth segment is somewhat thicker than the rest of the body. Semi-transparent, with the markings indistinct. Lateral line white, shaded with blackish above, the

black dots encircled with white. Duration of this stage about seven days. At this period, the larva was observed to use all its legs in walking ; but the exact period when this power was acquired was not noted.

AFTER FIFTH MOULT.—The body now appears green. A row of white spots, one on each segment, above the interrupted sub-dorsal line. Duration about seven days.

AFTER SIXTH MOULT.—Head rounded and smooth, slightly depressed at the vertex, partly withdrawn beneath the skin of joint 2. Pale-whitish, mouth-parts darker. Body semi-transparent whitish-green ; a lateral white line edged with blackish above. On each segment to the twelfth, an oblique blackish shade, running back from the base upward, and terminating in a white point on the next segment, these points forming a sub-dorsal row. The two points on joint 12 are nearer together and larger than the others. Joint 12 is thickened and larger than the other segments. There is an interrupted dorsal blackish shade with white points. Body furnished with thin, fine, short, whitish hairs. Duration of this stage seven days.

AFTER SEVENTH MOULT.—Mature larva. Similar to the preceding. Head slightly shaded with blackish above. The dorsal line appears as traces of a white dorsal stripe, edged with blackish on both sides, occurring in the fold between the segments. The color of the body is a darker, more velvety green, less transparent, but whitish beneath. There is a row of small whitish dots, one on each joint, above the spiracles, and another similar row between the dorsal and sub-dorsal lines. Each dot of both rows furnishes a short whitish hair. The two spots on joint 12 are quite conspicuous. Spiracles black. The larva rests with its body bent near the middle, forming a loop, the head touching the last segment. It feeds mostly at night. Length about 23 m.m. Duration of this stage about eleven days.

Pupation occurs in a very slight cocoon beneath the surface of the ground. There appear to be two broods annually, the winter being passed in the pupa state. This insect is common to America and Europe, according to Dr. Speyer.* Humphreys and Westwood give a figure of the mature larva,† and the same stage has been described by Edwards and Elliot.‡

* Entomologische Zeitung, Stettin, Vol. XXXVI., page 153.

† British Moths, Vol. I., plate 35, figure 5.

‡ Papilio, Vol. III., page 133.

NOTE ON THE GENERA GORTYNA AND OCHRIA.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

I have lately had an opportunity of examining bred specimens of the European *Ochria ochracea* (*flavago*). The clypeal tubercle may be felt with a fine pin or seen under the glass when the frontal scales are partly removed. We have two North American species agreeing with *Ochria*, viz., *Sanzalitae*, from California, and *Buffaloensis*, from the east. With the former, the European species has a nearer resemblance externally; our eastern species differing much in colour. The type of *Gortyna* Hüb., is *Micacca*, and the type of *Hydræcia* Guen., as indicated by an asterisk in the Species Général, is this same species. Consequently *Hydræcia* falls. The genus *Ochria* is used by Hübner for the sole species *flavago*, consequently this must obtain for the genus, which differs from *Hydræcia* of European authors mainly in the presence of the clypeal tubercle. While *flavago* resembles in colour several North American species of *Gortyna*, I may have overestimated its resemblance to our eastern *cataphracta*, although a resemblance certainly exists. The type of *Apamea* is now difficult to ascertain, but if, as I assume, it is really *nictitans*, it may give way to the earlier *Gortyna*, as the species do not seem to be generically separable. In CAN. ENT., XIV., 17, I gave a list of the North American species, which may be amended as follows:—

Gen. GORTYNA Hübner.

(= *Hydræcia* Guen.)

<i>purpuripennis</i> Gr.	<i>cataphracta</i> Gr.
<i>juvenilis</i> Gr.	<i>purpurifascia</i> G. & R.
<i>erepta</i> Gr.	<i>rutila</i> Guen.
<i>immanis</i> Guen.	<i>Harrisii</i> Gr.
<i>obliqua</i> Harv.	<i>speciosissima</i> G. & R.
<i>stramentosa</i> Guen.	<i>cerrussata</i> Gr.
<i>nictitans</i> Esp.	<i>marginidens</i> Guen.
var. <i>erythrostigma</i> Haw.	<i>limpida</i> Guen.
var. <i>lucens</i> Tr.	<i>appassionata</i> Harvey.
<i>inquæsa</i> G. & R.	<i>necopina</i> Gr.
<i>cerina</i> Gr.	<i>nitela</i> Guen.
<i>rigida</i> Gr.	var. <i>nebris</i> Guen.
<i>impecuniosa</i> Gr.	<i>serrata</i> Gr.

Gen. OCHRIA Hübn.

(= *Gortyna* Led.)

sanzalita Gr.

Buffaloensis Gr.

The genus *Gortyna*, as above defined, contains species of Noctuidæ, having the ♂ antennæ of various structure, fringed with hair, brush-like, in *serrata* pectinated. The front is smooth, thickly, somewhat woolly haired. Labial palpi short, with small terminal article. The thorax has an elevated scale ridge behind the collar, and a tuft behind, while the abdomen is stout and usually untufted. The eyes are naked, the tibiæ unarmed. The larvæ, so far as known, are internal feeders in roots and bulbs. They are livid or yellowish, with dark warts, and prothoracic shield; pupating in the ground.

CORRESPONDENCE.

PHALANGODES ROBUSTA (Pack.)

Dear Sir: Packard, in 1877, described this species from specimens taken in Colorado by Mr. E. Ingersoll in 1874, but the precise locality and habitat were entirely forgotten. In his recently published memoir on the Cave Fauna of North America (Proc. Nat. Ac. Sci., Vol. IV.), he re-describes the species, which is of extreme interest as being an out-of-door species of a usually cave-inhabiting genus, and suggests that it will probably be found under stones, though its precise manner of life, etc., remain as little known as in 1877. I am therefore pleased to be able to record that I have found a *Phalangodes*, agreeing quite well with *P. robusta*, in very considerable abundance by Swift Creek, Custer Co., Colorado, in damp places in a grove of *Populus tremuloïdes*, always under logs, and never, to my knowledge, under stones. This is about 8,200 feet altitude. I met with the same species under logs near Clearwater Creek, on the Grand Mesa, Mesa Co., at about 9,800 feet altitude.

May 31, 1889.

T. D. A. COCKERELL, West Cliff, Colorado.

A NEW MYRMOPHILE.

Dear Sir: On pp. 165-166, Vol. xx., Dr. Hamilton gives a list of eight species of *Cremastochilus* known to be Myrmophilous. I can add one other, namely, *C. Knochii* Lec., which I found in an ants' nest on March 30th, last year, near Swift Creek, Custer Co., Colorado, at about 8,100 feet alt. This was under a stone on the open prairie.

T. D. A. COCKERELL, West Cliff, Colorado.

Mailed July 2nd.

The Canadian Entomologist.

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No. 8.

IBALIA MACULIPENNIS, HALDEMAN.

BY W. HAGUE HARRINGTON, OTTAWA.

The genus to which this very interesting species belongs differs so widely from the rest of the Cynipidæ that it has been separated from them as a sub-family, under the title *Ibaliinae*. Its members can be readily recognized by the cultriform abdomen and more strongly veined wings, as well as by their greater size. The cultriform—*i. e.*, knife-shaped—abdomen is in itself remarkable enough to attract the attention of all who may chance to see the insects.

From Canada two species are recorded: *ensiger* Nort., ♀, and *maculipennis* Hald., ♀. The former I have not yet been able to find here, but Provancher (Faune Ent. Can., II., 554) records it as frequently seen. Both species were described from the United States (Pa.), with four others: *anceps* Say. (Ark.), *Montana* Cress. (Col., ♀), *rufipes* Cress. (Nev., ♀), and *scapellator* Westw. (Ga., ♂). The last is the only species of which the ♂ appears to be known. The present species was described by Haldeman (Proc. Acad. Nat. Sci., Phil., III., 127) as follows:—“*Ibalia maculipennis* ♀.—Yellow; meso and meta-thorax black, except the scutellum and two longitudinal bands above, and a spot beneath the wings; eyes, apex of antennæ, base of coxæ and middle of femora (the greater part of the posterior ones) black; posterior tibiæ blackish toward the apex; wings yellow, apex and a central spot fuliginous. Seven lines long, eleven expanse. South-eastern Pennsylvania, in May and June.”

A more detailed description of the ♀ is given by Provancher (Faune Ent. Can. Add., 165), and it is figured in the report of the U. S. Entomologist for 1877, but so far as I know there has been published no description of the ♂. It differs from the ♀, however, but slightly in general appearance, except in being darker in colour, especially the thorax. The abdomen is nearly straight above, instead of being curved as in the ♀, and the terminal segments are slightly swollen, so that,

viewed from above, the apical third of the abdomen appears thicker than the middle segments.

The antennæ have 14 joints, those of the ♀ having only 13. The third joint is longer and considerable stouter than the succeeding ones, and is deeply and obliquely excavated on the outer side, a little beyond the middle. Can this groove be of any use for holding the antennæ of the ♀? The object of the present note is to call attention to the habits of the species, and to indicate where it may be looked for; points upon which little, if anything, is known, I believe. Mr. Ashmead, to whom I sent a pair of these insects, wrote to me in regard to them:—"I know nothing of the habits of the *Ibaliinæ*, excepting what Giraud wrote, "Il est tres vraisemblable que sa larve vit parasite de quelque grande Coléoptère lignivore." "

The fact that an entomologist so well acquainted with the Cynipidæ, and the literature treating of them, had to make this admission, induces me to think that the few observations I have been fortunate enough to make (incomplete as they are) will be welcome to students of these insects, and may, perhaps, furnish a clue to enable other entomologists to work out the full life histories of the members of this anomalous and interesting sub-family.

My first acquaintance with *Ibalia maculipennis* was made in 1883, as I find by the following memo. in a note-book:—"June 28th. Two Hymenoptera, apparently ovipositing in maple." The note is illustrated by a rough sketch of the insect, sufficient to identify it. At this time my attention was given chiefly to Coleoptera, and other orders were only incidentally collected, so that no special value was attached to the observation. The following summer a specimen was taken on 26th June, but its label does not give any particulars, and no record of its capture is found in my note-book.

In 1886 I was fortunate enough to capture six specimens, of which three were ♂ and three ♀. My friend, Mr. Guignard, had taken a ♀ upon an old maple on 16th June, but it was five days later that I found my first two ♀ ♀. They were ovipositing upon an old, badly decayed maple; and in one instance the ovipositor was deeply inserted. Upon the same tree I captured another female, also ovipositing, on the 23rd June; and upon the same day secured my first male upon another old

maple about 100 yards away. The other two males were taken on 25th June.

None of the insects were seen in 1887, although carefully looked for in that locality, but during the past season they were again observed upon a different kind of tree and in a different locality. On 10th June, Mr. Fletcher captured two females ovipositing in a beech, and on the 24th June, while with him we each took a female upon beech trees in the same grove. That taken by myself was dead, having met with an accident while ovipositing.

Having thus recorded the dates of capture of the specimens coming under my observation, a few remarks may be made upon the manner of oviposition. When the ovipositor is not in use it forms a complete coil within the abdomen, which is really but a flat sheath to contain it, and so transparent that it is perfectly visible. The triangular ventral scale, which is the full length of the abdomen, closes into it like a knife-blade into its handle, and the ovipositor is completely protected. When the ventral scale is deflexed the abdomen has much the outline of a lobster's claw, and the ovipositor when protruded is seen to be fully an inch in length, or longer than the insect itself.

During the act of oviposition, the insect, by means of its long legs, keeps its body far enough from the surface of the tree to enable it to deflex the ventral scale at a right angle to the body, with the tip touching the bark. A perfect support is thus formed for the ovipositor, which is gradually worked into the tree in much the same manner as that of *Thalessa*.

All the insects observed ovipositing have been on the trunks of large trees, at an average distance of about two feet from the ground. The six individuals seen in 1883 and 1886 were all upon old maples, near Hull, on the Quebec side of the Ottawa river. The trees were old and rapidly decaying (in two instances already dead), having a diameter of nearly two feet, and with the bark proportionately thick, so that the ovipositor was none too long to reach the wood, unless the insect availed itself of crevices in the bark. The insects taken last June were all ovipositing upon large beeches in a grove within the city limits, and within a few minutes' walk of my own house. Mr. Fletcher informs me that each of those captured by him had the ovipositor deeply inserted, and that he had much difficulty in pulling it out—breaking it, indeed, in one instance. My own specimen,

as before stated, had died at its post, where it was held by the inserted ovipositor.

Here, unfortunately, our observations end, and we can only form conjectures as to the life of the larvæ. Provancher remarks of the genus that, "Their larvæ live as parasites in the body of other larvæ;" and with reference to *ensiger*, he says: "We have frequently met this insect in company of Braconids, upon trunks of dead fir-trees, searching without doubt to deposit its eggs in the body of lignivorous larvæ." His authority for the first statement is not given, but probably he has accepted the conjecture of some European Entomologist.

Prof. Riley has demonstrated, in the case of *Thalessa*, how unsafe it is to accept conjecture as fact, however probable it may seem. Still, in the absence of a complete knowledge of an insect's life, one must often fill in by conjecture the missing links, and wait for further investigations to prove their value. As regards *Ibalia maculipennis*, there are two ways in which the larvæ may live, viz., either directly upon the dead, or decaying woody tissues of the tree, or in or upon the bodies of larvæ which do so subsist.

The former course seems less probable, and I am inclined to think with those who believe that it is parasitic upon lignivorous larvæ. What species, then, is it likely to be parasitic upon? The maple trees upon which it occurs are badly infested by *Tremex columba*, *Xiphydria albicornis* and *Dicerca divaricata*, and in a less degree by other insects. The beech trees are also infested by the *Tremex* and *Dicerca*, and like the maples are much frequented by *Thalessa*. Is *Ibalia* parasitic upon its Hymenopterous (closely connected) relatives, or upon the Coleoptera?

Now that its time and place of occurrence are known, I hope that its history may soon be worked out in full. Its season of appearance is apparently brief, as all the specimens from this locality have been taken in June—the earliest upon the 10th, and the latest on the 28th. The insect might thus readily escape notice, even when not rare, as they are by no means conspicuous, either when ovipositing or crawling upon the rough trunks they frequent. But, if systematically searched for during the month of June upon old trees, they would probably be found by many of our entomologists.

While not abundant, these insects cannot be classed as especially rare, for besides the specimens mentioned in this note, I have seen several which

were in the collection left by the late Mr. Billings, of this city, and which were probably captured in this vicinity. I have also found a ♂ among some *Hymenoptera* sent to me for examination by Mr. Evans, of Trenton, Ont., and have been informed by Provancher that a specimen (without abdomen) was shown to him some years ago at St. Hyacinthe, Que.

One female taken in 1883 had the cavity of the abdomen swarming with small mites, which also covered the ventral scale, and were thickly scattered along the protruded ovipositor. They appear to belong to species distinct from any yet noticed, although I have found many insects which infest decaying wood to be subject to the attacks of such parasites.

A LIST OF THE BUTTERFLIES OF PHILADELPHIA, PA.*

BY HENRY SKINNER, M.D., AND E. M. AARON.

(Continued from page 131.)

Pyrameis Cardui.—Usually common ; some years quite rare.

Junonia cania.—Quite local ; never very common. Mr. Scudder, on page 501, speaks of its "rapid, strong and enduring flight." This would seem to indicate that the habits of this insect in the New England States differ materially from those in this locality or further south. It is rare that this butterfly is here observed over a foot from the ground, and then its flight is most erratic, and usually consists of a few fluttering strokes of the wing followed by an idle sail. This is also the manner of flight from Virginia to Florida, according to the observations of E. M. Aaron.

Limenitis ursula.—Rare.

Limenitis disippus.—Common.

Neonympha canthus.—Rare. A few specimens have been taken near Gloucester, N. J.

Neonympha eurytris.—Common in restricted localities.

Satyrus pegala.—Exceedingly rare ; taken at Mount Holly, N. J., by E. M. Aaron in 1884. It is recorded as from Gloucester, N. J., by the collectors of twenty years ago.

* The Authors wish to state here that as they belong to the two opposing schools in the matter of the capitalizing of specific names, they have left that matter to the judgment of the Editor. [The Editor sent the MS. unchanged to the printer.]

Satyrus alope.—Rare ; but few specimens known to have been taken nearer than Westville ; also at Mt. Holly, N. J., where it is quite common at times.

Libythea Bachmanni.—Exceedingly rare. Two specimens taken in West Fairmount Park.

Thecla halesus.—Very rare. Two or three were taken some years ago near Westville, N. J.

Thecla M-album.—Mr. Edwards, in his catalogue of 1884, records this species from Pennsylvania ; but, though taken on the New Jersey coast, we are not aware of its having been taken in this portion of our State.

Thecla humuli.—Not common.

Thecla calanus.—Not common.

Thecla smilacis.—Exceedingly rare.

Thecla Augustus.—Rare. Westville, N. J.

Thecla irus.—Rare. Only reported from Westville, N. J.

Thecla Henrici.—Rare. Westville, N. J.

Thecla niphon.—Rare. Fairmount Park and Westville, N. J.

Thecla Titus.—Exceedingly rare. Cobb's Creek.

Feniseca Tarquinius.—Very local ; never common. As a sample of its extremely local distribution, it may be stated that at Chamounix, in West Fairmount Park, this species is found flying around one tree, where, perhaps, 90 per cent. of all known to us to have been taken in this vicinity have been captured. There are several large beech trees there on which considerable numbers of *aphidæ* are nearly always to be seen.

Chrysophanus hypophleas.—Common. An albino form of this species was taken in Fairmount Park several years ago.

Lycæna pseudargiolus.—This species and its varieties are moderately common.

Lycæna comyntas.—Very common. Mr. Scudder quotes rather doubtfully the statement made by E. M. Aaron, in Vol. IX. of this journal, that this species was observed depositing its eggs on ragweed (*Ambrosia* sp.). Such, however, was the case.

Ancyloxypha numitor.—Common.

Pamphila massasoit.—Local ; never very common. Swamps west of George's Hill and Westville, N. J.

Pamphila zabulon.—Very local ; not common. The form *hobomok* is not so rare ; occasionally it is found in considerable numbers along Cobb's Creek. *Pochahontas* is a much rarer form.

Pamphila sassacus.—Very rare. West Park.

Pamphila Huron.—Exceedingly rare. Cobb's Creek.

Pamphila phylaëus.—Rare. West Park and Cobb's Creek.

Pamphila otho.—The typical form is only known to have been taken in one example near the Bartram Garden. The form *egeremet* is not common, though occasionally taken in some numbers near George's Hill reservoir.

Pamphila Peckius.—Exceedingly common. An odd form of this usually very constant species was taken near Benedict Arnold's house, in East Park. It is characterized by a marked suffusion of the black ground colour above, leading to a nearly complete obliteration of the markings on the secondaries, and the greatly restricted area of the light coloured markings, beneath which stand out separate spots rather than suffused areas, as is usual.

Pamphila mystic.—Though this species is not known to have been taken in the immediate vicinity of Philadelphia, we have thought it well to record it as having been captured in several examples at Penn's Manor, above Bristol, Penn.

Pamphila cernes.—Very common.

Pamphila manataagua.—Not common.

Pamphila verna.—Moderately common. The form *pottawattomie* has occasionally been taken here.

Pamphila metacomet.—Not common.

Pamphila accius.—Very rare. Cobb's Creek.

Pamphila panoquin.—Very rare. Cobb's Creek and George's Hill.

Pamphila ocola.—Very rare. Cobb's Creek and Eastwick's.

Pamphila Pontiac.—Very rare. West of George's Hill.

Pamphila Delaware.—In his original description, Mr. W. H. Edwards states that his types were taken in Philadelphia by Mr. Newman. This is the only authority that we have for attributing this species to our fauna.*

* Since the above was written, a single faded female specimen was taken, June 21st, by Master Joseph M. Aaron, at George's Hill Reservoir.

Pamphila fusca.—Not common, but has been taken in limited numbers in West Park and at Cobb's Creek. Mr. Edwards gives only "Gulf States" as the locality.

Amblyscirtes vialis.—Rare. Very local.

Pyrgus tessellata.—Common. The form *communis* has been taken in some quantity at Cobb's Creek and Fairmount Park.

Nisoniades brizo.—Rare. Westville, N. J.

Nisoniades icelus.—Very rare. Three or four examples have been taken near West Laurel Hill.

Nisoniades ausonius.—Not common.

Nisoniades martialis.—Very rare. George's Hill reservoir.

Nisoniades juvenalis.—Common.

Pholisora catullus.—Common.

Eudamus pylades.—Not common.

Eudamus Nevada.—Rare. Several specimens of this species have been taken in Fairmount Park. One of these is in the collection of E. M. Aaron, and, besides agreeing entirely with Mr. Scudder's description, has been determined as *Nevada* by Mr. W. H. Edwards.

Eudamus bathyllus.—Common.

There seems to be good reason to doubt the specific worth of these last three forms. It is quite likely that careful rearing will prove them to be forms of one widely spread species.

Eudamus lycidas.—Rare. Very local. Cobb's Creek and west of George's Hill.

Eudamus tityrus.—Very common.

Eudamus proteus.—Extremely rare. One specimen from East Park and two at Cobb's Creek.

In addition to the above list of eighty-six species the following are added here as accredited to this region, but are rejected by us on account of insufficient testimony:

Vanessa J-album.—In his latest work Mr. Scudder credits this species to our fauna as "'rare,' (Blake)." Mr. Blake informs us that he has

only taken this species in one specimen in Venango County, this State, and is not aware whence Mr. Scudder derives his information.

Thecla acadica.—This species is also referred to this locality by Mr. Scudder, and Messrs. Blake and Edwards are quoted as authorities. We fail to find anyone who has taken it or knows of its capture in this vicinity.

Chrysophanus thoe.—This species is attributed to this region by Mr. Scudder as “‘rare,’ (Blake).” As in the case of *J-album*, Mr. Blake is sure that he has never seen the species in this locality.

Chrysophanus epixanthe.—In this case Mr. Blake is quoted by Mr. Scudder as stating that this species is “neither common or rare.” Mr. Blake is not aware that it has ever been taken hereabouts, but he has taken it at DaCosta, N. J., thirty miles from Philadelphia, on the Camden & Atlantic R. R.

Hesperia unna.—This species, not yet incorporated in any of our catalogues, is described as a new species from “Philadelphia,” by Carl Plötz, in his “Die Hesperinen-Gattung *Hesperia* Aut. und ihre Arten.”—Stettin Entomologische Zeitung, Vol. XLIV., p. 204, 1883. This species is not compared with any of its congeners, and the description is vague and meagre. It is placed between *brettus* and *phylæus* in Herr Plötz’s arrangement of this genus. We are in doubt as to which of our known species it can be, but do not think it possible that it can be new.

While we feel, certainly with justice, that this list of eighty-seven species is a remarkable one for so restricted a locality, we do not suppose that it is entirely complete. If any of our entomologists can add to it or throw further light on the localities or numbers captured, we shall be glad to receive such information.

In closing, we desire to bear testimony to the great value of the work on our Eastern Butterflies, now being published by Mr. Scudder, a work that should be in the library of every student of the Lepidoptera. Our few critical allusions to this work above are made necessary, simply because the extreme care taken by Mr. Scudder to avoid error make those that have crept in the more observable, and, consequently, the more deserving of the pointing out.

Philadelphia, May 16, 1889.

POPULAR AND ECONOMIC ENTOMOLOGY—No. 4.

BY JAMES FLETCHER, OTTAWA.

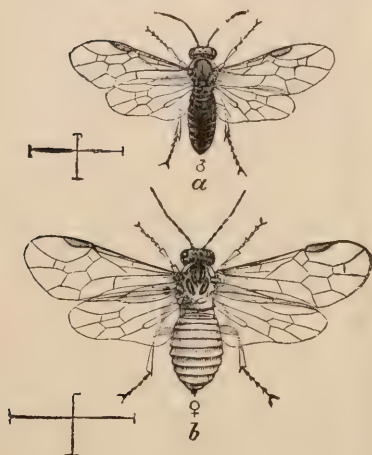
THE IMPORTED CURRANT SAW-FLY—(*NEMATUS RIBESII*, SCOP.).

FIG. 7.



FIG. 8.

Amongst insects which every year make their presence noticeably apparent by their injuries, and thus win the distinction of being "First-class Pests" to the fruit-grower, not one, perhaps, is better known, nor, when not checked in its operations, more annoying, than the currant worm, the larval state of the imported currant saw-fly, *Nematus Ribesii*, Scop. (= *N. ventricosus*, Klug).

This is a European insect, which, although it has only been noticed in America for thirty years, has already spread over a large proportion of the settled parts. Early in the spring when the buds are bursting upon the currant and gooseberry bushes, active yellowish four-winged flies will be seen flying around the bushes or crawling over the unfolding leaves. These are the parents of the currant worms. The two sexes differ a good deal in appearance. At Fig. 7, they are both represented enlarged. The hairlines at the sides show their natural sizes. The male is shown at *a*. It is slightly the smaller, and is much darker in color. The head and thorax are almost black, with some dull yellow spots. The abdomen is dark above but yellow beneath and at the tip. The wings are glossy

with dark veins. The males are equally abundant with the females, but are not so often observed, from the fact that they are seldom found on the bushes, but fly near the ground and beneath the bushes as if to welcome the females when they emerge from the soil, beneath which they have passed the winter in their snug cocoons. The females are larger than the males, and of a bright honey-yellow color.

The greenish-white glossy eggs which are about $\frac{1}{20}$ of an inch in length, are laid along the main ribs, beneath the leaves of gooseberries and currants, as shown at Fig. 8 (1). As soon as the young larvæ hatch, they at once attack the leaves upon which the eggs were laid, and eat small holes, as shown at Fig. 8 (2 and 3). They are very voracious, and their growth is very rapid indeed, little more than a week sufficing for them to pass through all their stages. These characteristics added to the large number of eggs laid by each female, make constant vigilance on the part of the fruit-grower a necessity, or he will find his gooseberry and currant bushes stripped of every leaf in a few days.

When the young larvæ come out of the eggs, they are about one-twelfth of an inch in length, with large heads and a semi-translucent body. At first they all remain on the same leaf, but as they grow large they separate and spread in all directions over the bush. They are green at first, then dark blueish green, covered with small black dots, each one of which bears a bristle, and lastly, after the last moult, pale green with yellow extremities.

When full grown they spin smooth oval brown cocoons, which, however, are sometimes of a greenish white colour. Those of the summer brood are generally on or near the surface of the ground, but at a considerable depth beneath it in the brood which passes the winter inside cocoons. The chrysalis state is assumed at once in the summer brood, and the perfect flies appear in about a fortnight. The autumn brood, however, passes the winter in the larval state inside the cocoons, and the larvæ only change to chrysalises a short time before the flies appear in the spring.

Notwithstanding that this insect is attacked by a host of parasitic enemies, it is generally necessary for the fruit-grower to apply active remedies. Of these, "White Hellebore" is the best. One or two ounces of this powder mixed in a little hot water at the bottom of a pail, and then

filled up with cold water, will give a sufficient quantity of the mixture to sprinkle a large number of bushes. This is most conveniently done with an ordinary clothes whisk. The powder may also be used dry; when mixed with four times its bulk of common flour, it should be puffed over the bushes after rain, when the dew is on them, or after they have been sprinkled with water. This is most conveniently done by means of the small hand-bellows, now obtainable at all chemists. With regard to the danger of using this material, I will quote from an excellent and very complete article upon this subject by Prof. W. Saunders, which appeared in our Ent. Soc'y, of Ont. Rep. for 1871-2, p. 32.

"It has been urged against hellebore that it is poisonous, and great outcries have been made against it on this account. It is quite true that hellebore is poisonous when taken internally in quantities, but if used in the manner we have indicated, no fear need be entertained of the slightest injury resulting from it. Examined immediately after a thorough sprinkling with the hellebore mixture, the quantity on any bunch of fruit will be found to be infinitesimal, and the first shower of rain would remove it all. If it be found necessary at any time to apply the mixture to bushes where the fruit is ripe and just ready to be picked, it might then be washed in water before using, which would readily remove every trace of the powder. During the past ten years many thousands of pounds of hellebore have been used in Europe and America for the purpose of destroying this worm, and we know of no case on record where injury has resulted from its use."

Another insect of the same family, and with very similar habits to the above, is the Larch Saw-fly, *Nematus Erichsonii*, the larvæ of which are now spreading rapidly over the Eastern United States and Canada. I have received enquiries concerning it from several of our members in different provinces of the Dominion, particularly from Nova Scotia and Quebec. The eggs of this species are embedded in the soft wood of the young shoots of the tamarac when growth first begins in June. The growth is stopped on the side where the eggs are deposited, and the twig becomes distorted and is eventually destroyed. This injury, however, is slight compared with the destruction of the foliage. There are at the present moment in Canada, from the Atlantic coast as far west as Ottawa, thousands of acres of tamaracs entirely stripped of their leaves. In a later number a fuller account of this injurious insect will be given.

ADDITIONS TO THE CANADIAN LIST OF LEPIDOPTERA.

BY J. ALSTON MOFFAT, HAMILTON, ONT.

These names I have obtained from various sources :—

Glea inulta Grote.

Nonagria fodiens Guen.

Plusia Ni. Hub.

Acidalia insulsaria Guen.

Cymatophora humaria Guen.

Glaucopteryx cæsiata Borkh.

Botis adipaloides G. & R.

Eurycreon sticticalis Linn.

For the following I am indebted to the kindness of Prof. Fernald :—

Conchylis floccosana Walk.

Ecopsis olinaceana Fern.

Steganoptica fasciolana Clem.

Gelechia alasella Clem.

Gelechia bilobella Zell.

Gelechia vagella Walk.

Carposina cressentella Wlsm.

Blabaphanes dorsistrigella var.

flavivittellus Fitch.

The collecting season of 1888 was, in this locality, somewhat peculiar. It opened up about the 10th of May with great promise—early moths appearing in considerable numbers. This was soon reversed—cool, dry weather setting in ; and not until the second week of June did the weather become warm enough to produce a marked development of insect life. About that time I obtained some fine moths new to me : several of them being but single specimens of a kind are yet undetermined. Fall hunting was quite productive of some kinds of good moths. I spent the first two weeks of September sixteen miles south of the city. I could find nothing of any value by hunting in daytime ; plenty would come to light when the evenings were warm ; but these were mostly so cool that it was necessary to keep the doors closed for comfort, thereby reducing my chances. It was at this time that I secured a pair of fine, fresh *Glea inulta*, a large and handsome moth, and the first of the genus reported to have been taken in Canada. I got the name of it from Mr. Hulst, by sending to him a specimen that had been given to me by Mr. Hanham, which he had captured in Missouri.

THE NOCTUIDÆ OF NORTH AMERICA AND EUROPE.

(Second Paper.)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

2.—Sub-family *Noctuine*.Tribe *Bombycoidi*.

The sub-family *Noctuine* embraces the typical *Noctuidæ*, and we may take the genera *Agrotis* or *Hadena* as normal forms, from which we have a mass of more or less divergent structural groups. The characters which are made the basis of generic sub-division, according to a natural system which I find most plainly indicated in the writings of Stephens and Lederer, need not delay us here, for the reason that I have exposed them in previous writings. It remains for me to briefly point out that I have changed the basis for a classification of our North American genera from that of Guenée to that of Lederer, commencing in my first synonymical list, Buffalo, 1874, to bring them together in a preliminary shape. When, nearly thirty years ago, I commenced my study of these forms, there were not a dozen species named in any collection, public or private, in America. In my last (MS.) list are over 1,500 names, and three-fourths of this number are taken from my descriptions or identifications. This represents continuous work; for large collections were not at first in existence, and the new forms came in singly, or in small parcels, and had to be classified; so that, from this fact, the generic determinations were often tentative. Added to this, the difficulty of determining the species described by Guenée and Walker, and the absence of illustrations, produced a state of affairs in our knowledge of the *Noctuidæ*, which the student of to-day is largely exempted from. And *la verita è la pin ingrata delle dulcinee*.

The main mass of the *Noctuidæ* falls into three divisions, or sub-family groups, only separable by their comparative form. These are: the typical *Noctuidæ* (*Noctuine*), the *Noctuæ nonfasciatae* of Borkhausen; the geometriform *Noctuidæ* (*Catocalinæ*), the *Noctuæ fasciatae* of Borkhausen; and the pyralidiform *Noctuidæ* (*Deltoidinæ*). The fact that the latter are not separable from the *Noctuidæ*, and are not *Pyralidæ*, was first shown by Herrick Schæffer.

In *one* North American genus, I have shown that vein 5 is midway

between 4 and 6 on the primaries. This is contrary to Lederer's definition, and, so far, is a single instance ; vein 5 being, in all others examined by me and as laid down by Lederer, nearer 4 than 6 on both wings, while on the secondaries it is often weaker than the rest, or wanting. I do not feel sure that the neuration should absolutely guide us ; it does not seem certain that, in the species not yet examined, it will precisely agree. The absence of an accessory cell is, in the *Noctuidæ*, exceptional, and as yet it cannot here, or in other families, be used as a character, except in a general way. In the *Sarothripinæ* and *Chloephorinæ*, for instance, sub-families of the *Bombycidae*, it seems to be wanting, as also in some *Lithosiinæ*, i. e., *Nudaria* ; but, as a general character, it may be said to be either usually wanting or usually prevalent, until every species has been examined and the neuration compared, which is far from the case. In my papers I used it as a general character, not describing particular forms ; hence, while the statement may be modified from a larger knowledge of the neuration of all the genera and species, it does not imply a distinct error, such as was committed in the original description of the neuration of the genus *Cerathosia*, where vein 5, on hind wings, was stated to be absent, whereas it is present, and where the configuration of the accessory cell and emanating veins on fore wings were inaccurately given. The neurational distinctions given by Lederer. will not, then, positively distinguish the *Thyatirinæ*, which, in other respects, seem true *Noctuidæ*.

The sub-family *Noctuinae*, or typical *Noctuidæ* is, then, founded on comparative form, the hind wings being usually unbanded and the body hairy or tufted. I have divided it into various tribes, founded on comparative characters, grouping about some representative genus. The first of these is the *Bombycoidea* of Authors, in which the larvæ are hairy or bombyciform, and are often singular in appearance or habit. The moths often present some resemblances to the genus *Bombycia*, and again to the *Dasychininae*. In this tribe the head is usually sunken, the labial palpi short, often hanging (and this character marks bombyciform moths); the thorax has a posterior tuft, while the legs are unarmed. This latter character will warrant my reference of *Copablepharon* to the *Agrotini*. The caterpillars make cocoons, and are 16-footed. The European genera *Diloba*, *Eogena* and *Clidia*, with single or few species, do not seem to occur in North America. If we have a true species of *Demas* (Mr. Morrison's *Demas* is a Hadenoid form), then this European genus has a

representative, but I only know it from a description. The European genus *Trichosea* (for *ludifica* = *Diphthera*, incorrectly credited to Ochsenheimer, see Check List, 1876, p. 36) seems allied to the forms I have separated under *Charadra*, Walk. *Raphia*, Hubn, is represented by our two species, *frater* and *abrupta*—one with white, the other with fuscous or gray secondaries. Instead of *Panthea*, we have the American genus *Platycerura* of Packard, which has strong resemblances to the *Dasychirinae*. In *Arsilonche*, we have either a representative or identical species. So far as this tribe is concerned, the resemblance between the faunæ may be considered nearly as great as in the *Thyatirinae*.

Tribe *Apatelini*.

It seems difficult to separate the following genera from the preceding tribe. The labial palpi seem less dependent; there is still a posterior thoracic tuft, and the larvæ are still hairy or peculiar; some bore into wood or pith to pupate; a cocoon is generally made. But the form is smoother, approaching the typical *Noctuinae*. *Diphthera* Hubn. (= *Moma* Auct., not Hübner.) has a representative species in our well-known *D. fallax*. *Apatela* Hübn, the typical genus, is resolvable into a number of groups, based chiefly on the larval form. I do not think that Butler is warranted in considering the species generically separable. He would refer the moths on this account to actually different families. But the moths are very similar in color and structure; and I consider the larvæ have undergone independent modification. The leading European groups are represented, and such species as the American *A. occidentalis*, *A. funeralis*, *A. vulpina*, described by myself, may be considered as a strictly "representative" species. The character of the genus is changed, and its limits perhaps reach with the Californian groups *Merolonche*, and the Eastern group *Eulonche*, not found in Europe. Our American forms outnumber the European three to one, and this preponderance will be found in most of the leading genera of the *Noctuidæ*, such as *Apatela*, *Hadena*, *Mamestra*, *Agrotis*, *Catocala*. Whether we can separate the *Bryophilini* as a distinct tribe, is doubtful. The passage seems to be formed by the American genera *Harrisimemna*, *Cerma*, *Polygrammate*, *Microcoelia*. These forms seem peculiar, as also the genus *Chytonix*, which follows *Bryophila*, although, I am not certain of this. Guenée has apparently described the type as a species of *Apamea*, and thus related to *Hadena*. The thoracic vestiture is, however, more like that of *Bryophila*, a lichen-feeding genus of

which we have one Eastern species, the *Bryophila lepidula* Gr. On the whole, the resemblance of the two faunæ is here, again, quite close. Genera with single species, peculiar to each fauna, occur, but the parentage is obvious, and but small modifications seem to be offered. These first tribes of the *Noctuinae* seem to belong to the circumpolar element in our moth fauna, with the *Thyatirinae*. The position formerly given by me to the American *Dicopini* seems susceptible of a change. If we place the *Agrotini* where Lederer puts them, these Dicopid genera, with a claw on the front tibiæ, seem to fall in better between the *Agrotini* with spinose, and the *Hadenini* with unarmed tibiæ. They have, especially *Dicopis*, a decided resemblance to the *Hadenini*; but the larvæ are apparently unknown, and may assist our classification by offering determinative characters.

The following table will assist in giving an approximate idea of the correspondence between the two faunæ. Allowance must be made that the North American fauna is less exhaustively known:—

EUROPE.

NORTH AMERICA.

Diloba 1 sp.

Simyra 3 sp.

Arsilonche 1 sp.

Eogena 1 sp.

Clidia 2 sp.

Raphia 1 sp.

Demas 1 sp.

Trichosea 1 sp.

Panthea 1 sp.

Diphthera 1 sp.

Apatela 15 sp.

Bryophila 9 sp.

Arsilonche 1 sp.

Raphia 2 sp.

Demas 1 sp.

Platycerura 1 sp.

Audela 1 sp.

Charadra 5 sp.

Momaphana 1 sp.

Diphthera 1 sp.

Apatela 54 sp.

Harrisimemna 1 sp.

Cerma 1 sp.

Microcoelia 2 sp.

Bryophila 3 sp.

OBSERVATIONS ON SOME NORTHERN DERBIDÆ.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

The small group of Homopterous insects included by Fabricius in his genus *Derbe*, but now separated as a sub-family from the other Fulgoridæ under the name of *Derboides Spinola* or *Derbida*, Stal, have always been objects of interest to students of this order, partly on account of their delicate form and peculiar structure, but their almost universal rarity has doubtless added much to their attractiveness. A series of these frail North American forms, differing in several respects from their tropical allies, were first made known in 1819 by Mr. Kirby, who arranged them under two genera—*Otiocerus* and *Anotia*, describing under the former eight, and under the latter one species; to *Otiocerus* three species from the United States were added by Dr. Fitch in 1851 and 1856, and one by Dr. Stal from Cuba, in 1859; to *Anotia* Dr. Fitch added three species in 1856. Thus, as the genera now stands, *Otiocerus* has twelve North American species, and *Anotia* four, but future study will probably result in placing two or three of these as mere varieties. As has been stated, *Otiocerus* was established by Kirby in a paper read before the Linnæan Society of London, in 1819. This paper appeared in Vol. XIII. of the Transactions, published as a whole in 1822, but probably somewhat earlier as a separate. In 1821, Germar, in the fourth volume of his *Magazin der Entomologie*, characterized his genus *Cobax* for a specimen of Kirby's *O. Stollii*, which he had received from Bahia, describing the species as *C. Winthemi*. Notwithstanding the fact that he claims the presence of ocelli for his genus, it seems to be equivalent to Kirby's *Otiocerus*, in which they are apparently absent, and is consequently placed as a synonym. In 1832, Burmeister, in his *Handbuch der Entomologie*, redescribed *O. Degeerii* as *Hynnis rosea*, differentiating his genus from *Otiocerus* by the extension of the elytra at their inner apical angles; but this character is now considered as of but subgeneric value at most. Genus *Anotia* was founded by Kirby on a single female example of *Bonneti*, and judging from a male in my collection, would seem to need modifying to include both sexes.

I propose in the present paper, after recording brief observations on a few species of *Otiocerus*, to describe a pretty little form occurring here, for which I find it necessary to establish a new genus, intermediate in character between *Anotia* and *Mysidia*.

Otiocerus Degeerii, Kirby. This, our largest species, is not uncommon here through July, August, and September. In color it varies from pale reddish to brownish purple, but always shows the white line on the suture before the appendix, and at the tip of the elytra. The antennæ, which are comparatively small, have but one appendage in both sexes. The males are a little smaller than the females, and are less frequently met with.*

Otiocerus Stollii, Kirby. One specimen, a male, beaten from an oak near this city, August 18, 1888. This small species is of the same dark color we find in the preceding. A pale rosaceous vitta occupies the vertex, the middle of the thorax, and the elytral suture, as far as the tip of the clavus, beyond which is a pale line at the base of the appendix, as in *Degeerii*. The two carinæ, which are closely approximated on the point, diverge slightly just before the apex; on the vertex they are a little arched above the eye, and their edge is finely crenated. The antennæ are larger than in *Degeerii*. This insect must have a wide distribution, as it was described from Georgia by Kirby, and from Bahia, Brazil, by Germar. It is quite distinct from the *O. Stollii* of Spinola (*Ann. Soc. Ent.*, Fr. VIII., p. 385), and of Amyot & Serville (*Hemip.*, p. 514), which Dr. Fitch considers equivalent to his *Amyotii*.

Otiocerus Coquerbertii, Kirby. This, our most beautiful, as it is our most abundant species, occurs here with *O. Degeerii* from July to Sept. on various trees and bushes, especially on the beech, maple, oak, and hickory. Its two appendages exceed the antennæ in length. In size it approaches *Degeerii*, but represents another facies of the genus; distinguished by a pale ground color, relieved by a broad vitta of red or fuscous, extending from the tip of the head across the eye and thorax, and along the elytra near the suture to the tip of the clavus, where it forks, one branch bordering the internal apical margin, the other deflected to the apex of the costa. Their wings are clear or white, immaculate, and the frontal keels are approximate on the lower part of the face. Here belong *Signoreti*, Fitch; *Reaumurii*, Kirby; *Wolfii*, Kirby; and *Amyotii*, Fitch.

(TO BE CONTINUED.)

* Since writing the above, M. Provancher has (*Petite Faune Ent. du Canada*, Vol. III. *Hemip.*, p. 217, May, 1889) described an insect as *Amphixepa* (!) *Coquerbertii*, referring it to Kirby's species with hesitation. From his description it cannot be the *Coquerbertii*, but it agrees in every particular with pale examples of *Degeerii* that not infrequently occur here, and probably should not be considered as deserving even a varietal name.

ON EARLY STAGES OF SOME LEPIDOPTERA.

BY WM. BEUTENMÜLLER, NEW YORK.

Chionobas Macounii, Edw.

EGG.—White, subglobose, slightly flattened above and below, with about seventeen longitudinal ridges, which are connected by numerous fine transverse ridges. Length, about 1.2 m.m. Width, about 1 m. Laid July 11. Emerged July 27.

YOUNG LARVA.—Head whitish, globose, rather large, finely punctured, mouth parts black. Body above bright pink, with a series of four whitish longitudinal stripes on each side; those on the dorsal region are very broad, with the intervening spaces very narrow. The lateral stripe very fine, and the one below the spiracles very broad. The spaces between these stripes rather broad. Spiracles black. At the posterior extremity of the body is a short, fork-like process. Underside of body pinkish, without markings. Length, about 2 m.m. Food-plant—Grass (*Poa pratensis*). I very much regret not to have been able to raise the larvæ to maturity, but hope that Mr. James Fletcher, from whom I received the eggs, may have further notes upon this interesting species.

Ancyloxypha numitor, Fabr.

EGG.—Semi-spherical, yellow, rounded at the side and top, base flattened. After two days the egg became dirty-whitish, speckled with bright red. Length, about 1.5 m.m. Width, about .75 m.m. Laid on Grass (*Setaria op.*), Sept. 8.

Arzama Obliquata, G. & R.

MATURE LARVA.—Head, subcaudate; rugose, chestnut brown, sometimes jet black; shining. Cervical shield, rugose, chestnut brown, sometimes black. Body above, shining olive brown, with numerous very fine transverse wrinkles, which are hardly visible to the naked eye; posterior segment much depressed. Spiracles black. Body beneath, dirty brownish white, including the abdominal legs, which have a chestnut brown or jet black patch on the outer side of each, and the extremities black. Thoracic feet chestnut brown or jet black. Length, about 55 m.m. Found several full grown specimens under decaying stumps, Sept., 1888.

Mailed August 1st.

The Canadian Entomologist.

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LONDON, SEPTEMBER, 1889.

No. 9.

SOME TEXAS, ARIZONA AND CALIFORNIA MOTHS.

BY G. H. FRENCH, CARBONDALE, ILL.

Ameria Texana, nov. sp.

Expanse .80 inch. Of the size and shape of *A. Unicolor*; the hind wings more rounded at anal angle, in that respect more like *Euphanessa Mendica*; body slender, antennæ pectinate; palpi slender, short, projecting beyond the front less than in *A. Unicolor*. Color uniform gray drab, the wings diaphanous, antennæ concolorous except the inside of pectinations at base where they are black, sides of head, back of eyes and a little at base of fore wings and abdomen slightly ochraceous.

Described from a single ♂ specimen from Hockley, Texas, from my friend Leopold Hartmann; his number 187.

Plusia Arizona, nov. sp.

Expanse 1.50 inches. Fore wings rich, shining, metallic golden, much like greater part of the wing of *P. Howardi*. It is marked with rich purple brown in three patches; the first basal triangular, small, reaching from the costa at the base to the posterior margin about one-fourth the distance from body to posterior angle; the second costal, quadrate, extending to median vein, one-fourth from base; the third costal, subquadrate, at the end of cell, partly within and partly beyond, spreading out towards apex; all three connected by a narrow costal margin of the purple brown. Fringe purple brown, cut with paler. Hind wings whitish, fringe the same, a dark hair line at base of fringe. Thorax pale as though purple brown washed with ochraceous, the ends of tufts darker; the outer patch on fore wings washed with ochraceous in its outer part.

Described from one ♂ from Arizona. This and another specimen were collected by H. K. Morrison in Arizona a number of years ago, and have been in my cabinet ever since. The other specimen may have been destroyed, as I do not find it now. This differs from *Howardi* chiefly in having one more purple brown spot. The basal spot or patch is broadest posteriorly, coming to a point on the costa.

Plusia Lenzii, Behrens, MS.

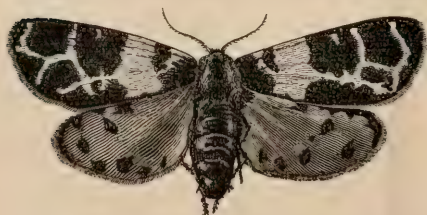
Expanse 1.60 inches. This species is related to *P. Scapularis* Hy.

Edwards, in the position and somewhat the shape of the markings, but differs in color. General color fawn, with a purplish brown tint at the base above the cell and the basal portion of posterior margin. From the apex to the posterior angle extends a band about one-tenth of an inch wide of dark metallic golden, something of a golden sheen over the space from this band to end of wing; from the cell to posterior margin, between the t. a. and t. p. lines, in a patch that is brownish yellow, more distinctly yellow below the silver spot, this shade extending a little over the golden band at anal angle, the patch shaded with purplish brown at posterior margin near t. a. line; the most of the wing with a slight golden sheen. Silver spot short blunt boat-shaped, from median vein to fourth median veinlet. Posterior wings smoky, most prominent in terminal third.

Head and thorax fawn gray, hairs of second joint of palpi slightly rosy tipped, tufts of thorax with a brownish yellow tinge, the tips of scales of thoracic tufts and patagia lilac in side light.

Described from a single ♀ from Siskyon, Shasta county, California, taken by my friend James Behrens and by him dedicated to our mutual friend, Dr. Henry Lenz, of Lubec, Germany.

Arctia Shastaensis, Behrens.



Arctia Shastaensis, Behrens. Female—natural size.

Since publishing the imperfect description of this form in the February number of the current volume of the CANADIAN ENTOMOLOGIST, page 35, Mr. Behrens has sent me a fine colored drawing of the specimen made before it was mutilated by travel, and from which the accompanying wood engraving was made. From the drawing I am inclined to think that it is entitled to rank as a species, as the species of *Arctia* go. It is certainly widely separated from *Achaia* by its shape and markings, and from *Behrii* by its size as well as markings. The light parts of fore wings are yellow, with a slight indication of orange; the hind wings cherry red or near a crimson with black as indicated in the illustration. The abdomen is black on the sides and centre of dorsum with a subdorsal line of red. As shown by the antennæ and abdomen the specimen is a female.

Arctia Genura, Strecker.

Among some other specimens sent me by Mr. Behrens from Soda Springs, near Mount Shasta, California, are two other *Arctias* that I am

inclined to refer to the above species. But two examples of *Arctia Genura* have, so far as I know, been taken before, one male now in Mr. Strecker's cabinet, taken by myself in Gilpin county, Colorado, at about 8,500 feet elevation, and another female in my cabinet taken at the same place by Miss Lillie Lake. If these be the same it shows a wide range for the species in the high altitudes. Both specimens have three transverse bands on the fore wings, arcuate, the first and second reaching the hind margin, but the third at a point below the longitudinal stripe. Neither has the basal half line, but one has a few pale scales on the costa the same as the female from Colorado. The light marks on the fore wings of one are yellow with a slight orange tint, the hind wings red with two rows of small black spots and a narrow terminal border; the other has the light part of fore wings yellow, less orange tinted than the other, and the hind wings yellow, but with the black the same as on the other. The abdomens are wanting, but from their appearance I take them both to be males. It is with some doubt that I refer these specimens to *Genura*, as there is no indication of a fourth or basal half transverse line except the few pale scales on the costa of the lighter one, and the spots on the hind wings of these are smaller than in the ♂ of *Genura*, as figured by Mr. Strecker; but the species of *Arctia* are generally so variable, and these come so near the typical *Genura*, that I prefer to refer them to this species provisionally to creating a new species.

Aegeria Pinorum, Behrens MS.

Mr. Behrens sends me a colored drawing and a description of an insect to which he gives the above name. It comes from Monterey, in *Pinus Insignis*, from which larvæ have been obtained. From these larvæ he bred one specimen from which the drawing was made. He says the larva lives under the bark of the tree, feeding on the inner bark and perhaps outer wood. From the wound made by the larva, there is quite a flow of resin, the pupa being formed in the inner flakes of this resin. By detaching such flakes of resin, five or six inches long, about as wide and more than an inch in thickness, pupæ and larvæ have been discovered nicely ensconced in rounded holes next to the bark.

The wings are vitreous with golden scales scattered over the surface, the veins dark; legs dark and golden; body steel blue with six golden bands, the last the terminal tuft.

Mr. Behrens did not state whether the specimen was a male or a female, but I think from the drawing it was a male.

EARLY STAGES OF *GRAPTA J-ALBUM*.

BY SHELBY W. DENTON, WELLESLEY, MASS.

Since the food plant and early stages of *Grapta j-Album* appear to be unknown, perhaps the following notes (incomplete as they are owing to my ignorance of the species larvæ I was rearing) may still be of some value and shed a little light on the early stages of this fine butterfly.

On May 17th of the present year, while passing a clump of white birches I noticed a leaf, on the upper surface and at the extreme end of which clustered a number of small caterpillars. They were dark brown, almost black, in color, covered with black spines and not much, if any, longer than a grain of wheat. Not knowing at the time what species of Lepidoptera they would eventually make, I simply plucked the leaf and took no further trouble to look for others, or the empty egg shells of these which must have been near at hand, as they were apparently out but a short time.

There were fifteen in all, and these were easily reared by keeping in a jelly glass, feeding with leaves of white birch until they grew too large for the glass, when they were transferred to an ordinary rearing cage. During the earlier stages they moved about very little, feeding side by side, but remaining quite motionless in the middle of the day.

Previous to moulting the last time, they became quite dormant, each one selected a leaf, covering the upper surface more or less with silk, thus partly curling the leaf, thereby hiding themselves within, and with head downward, remained in this position till the desired change took place.

In this stage, and in fact all along, no two were alike in color, although there was a general similarity between them. Perhaps they can best be described as greenish underneath, while the whole upper surface was brownish or almost black, with the exception of two yellowish or whitish lines along the back. Between the segments they were pinkish in color, with the spines along the upper surface still black and branching, those along the side having changed to yellowish green. Length at this stage, about $1\frac{1}{2}$ inches and not quite as large around as a lead pencil.

In the last stage, and before pupating, the caterpillar became a translucent green, the white streaks on the back faded or disappeared, the base of the branching spines became light colored and the dark upper surface became less in extent and much paler, not so decided.

On June 7th the first one spun a button and attached itself, and by June 12th all were in a chrysalis state.

The pupa, after hardening, when held at arms length, appeared flesh colored, but on closer examination this tint was confined to the more exposed parts, and it was then seen to be of a beautiful clear green; yet they were not all alike in color, some being darker, some lighter than others, while several had a sort of bloom on them, as if dusted with flour, which gave them a whitish appearance, but all united in having six golden spots on their upper surface. Fully forty-eight hours before giving imago the colors of the future butterfly could be distinctly seen through the thin shell.

On June 20th, at 7 a. m., the first chrysalis gave a male imago, half an hour later another male followed, and by 7 p. m. nine had emerged, but of these only one proved to be a female. It was not till the butterfly appeared that I obtained positive knowledge of the species of insect I had been so fortunate as to rear, and then regretted the opportunity I had lost in taking full notes. I immediately sent one to Mr. W. H. Edwards in hopes it might reach him in the chrysalis state, and selected for this purpose the one last formed, but a postal from that gentleman a few days later informed me the imago had emerged while *en route*.

The following morning, June 21, two more had made their appearance, both females, and by 8 p. m. the remaining three, one of these proving a female, so that out of the fifteen I began with all were carried to the imago state without the loss of a specimen, except, perhaps, the one sent Mr. Edwards, which would doubtless have been perfect had it reached him in time.

I wish to call attention to the few females in comparison with the number of males (as I do not know the sex of the one sent Mr. Edwards that can be left out of the calculation), thus we have ten males and four females. That this proportion would hold good in a large number remains to be proven, but the uncommonness of the butterfly, as a rule, and the fact that none of mine were attacked by parasites, has led me to believe that it does, and possibly this may account for the scarcity of this fine insect. Also note that the males were the first to emerge.

The females can be distinguished at a glance, having the dark portion on the underside much lighter than in the male.

In conclusion:—It seems safe to say that the eggs are laid in small clusters in the latter half of April or first of May, and that search should be made for them at this time on the outermost leaves of the white birch, which is one, if not its only, food plant; that the larval state continues for at least three weeks, while that of the chrysalis about ten days.

ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.

In pursuance of the call published in the CANADIAN ENTOMOLOGIST, in *Entomologica Americana*, and distributed by James Fletcher, President of the Entomological Club of the A. A. A. S., the following persons met in Toronto on August 28th, at 4 p.m.:—James Fletcher, Clarence M. Weed, A. J. Cook, L. O. Howard, John B. Smith, C. J. S. Bethune, H. Garman, W. Saunders, C. W. Hargitt, and others. Organization was effected by the election, upon motion of Prof. J. B. Smith, of Mr. James Fletcher as Chairman, and Clarence M. Weed as Secretary. Mr. Fletcher, in taking the chair, set out the advantages of organization, and urged the formation at the present time of an association that might be specially devoted to entomology in its economic aspect. Remarks to the same purpose were made by Prof. Cook, Prof. Smith, Mr. Weed, Mr. Howard, Dr. Bethune and Mr. Garman. After full discussion, Prof. Cook moved, seconded by Prof. Smith, that we do now decide to organize an "Association of Official Economic Entomologists." Carried unanimously.

Mr. Fletcher submitted a draft of a constitution drawn by Mr. Howard and himself, after consultation with others.

The proposed constitution was discussed clause by clause, amended and corrected, and finally adopted as a whole in the following shape:—

CONSTITUTION.

1. This Association shall be known as the Association of Official Economic Entomologists.

2. Its objects shall be : (1) To discuss new discoveries, to exchange experiences, and to carefully consider the best methods of work ; also (2) to give opportunity to individual workers of announcing proposed investigations, so as to bring out suggestions and prevent unnecessary duplication of work ; (3) to assign, when possible, certain lines of investigation upon subjects of general interest ; (4) to promote the study and advance the science of entomology.

3. The membership shall be confined to workers in economic entomology. All economic entomologists employed by the general or State Governments, or by the State Experimental Stations, or by any agricultural or horticultural association, and all teachers of economic entomology in educational institutions, may become members of the Association by transmitting proper credentials to the Secretary, and by authorizing him to sign their names to this constitution. Other persons engaged in practical work in economic entomology may be elected by a two-thirds

vote of the members present at a regular meeting of the Association, and shall be termed associate members. Members residing outside of the United States or Canada shall be designated foreign members. Associate or foreign members shall not be entitled to hold office or to vote.

4. The officers shall consist of a President, two Vice-Presidents and a Secretary, to be elected annually, who shall perform the duties customarily incumbent upon their respective offices. The President shall not hold office for two consecutive terms.

5. The annual meeting shall be held at such place and time as may be decided upon by the Association. Special meetings may be called by a majority of the officers, and shall be called on the written request of not less than five members. Eight members shall constitute a quorum for the transaction of business.

6. The mode of publication of the proceedings of the Association shall be decided upon by open vote at each annual meeting.

All proposed alterations or amendments to this constitution shall be referred to a select committee of three at any regular meeting, and, after a report from such committee, may be adopted by a two-thirds vote of the members present, provided that a written notice of the proposed amendment has been sent to every voting member of the Association at least one month prior to date of action,

(Signed) JAMES FLETCHER,

A. J. COOK,

JOHN B. SMITH,

CHARLES J. S. BETHUNE,

L. O. HOWARD,

CLARENCE M. WEED,

E. BAYNES REED,

H. GARMAN,

C. W. HARGITT.

The hour being late, Mr. Howard moved an adjournment to the 29th, after the meeting of the Biological Section of the A. A. A. S. Carried.

The Association met, pursuant to adjournment, at the call of the Chairman *pro tem*, at Scarborough Heights, near Toronto, at 4 p.m., Aug. 29th; the Chairman, Mr. Fletcher, taking the chair. On motion of Prof. J. B. Smith, seconded by Mr. L. O. Howard, the reading of the minutes of the meeting of the Committee organizing the Association was dispensed with, and resolved that the members present do sign the constitution as read and approved at the last meeting, and that by their action the Association of Official Economic Entomologists be, and is hereby duly organized. The following members then signed the Constitution in the order named:—James Fletcher, Chairman; A. J. Cook; John B. Smith; Chas.

J. S. Bethune ; L. O. Howard ; Clarence M. Weed ; E. Baynes Reed ; H. Garman ; C. W. Hargitt. The Secretary was authorized to transfer the signatures to the minute book of the Association, and to add the signatures of those who had expressed a desire to join in the work of the Association.

Letters were then read from Dr. F. Goding, Illinois, and Dr. J. A. Lintner, New York, expressing sympathy with and approval of the objects of the Association, and asking to be enrolled as members.

On motion of Prof. Smith, seconded by Mr. Weed, the election of officers was then proceeded with.

Prof. Smith nominated Prof. C. V. Riley as first President of the Association, stating that his recognized pre-eminent position as an economic entomologist, and his active interest in the work of establishing this Association, entitled him to the honor and recognition of the Association by election to that office. The nomination was seconded by Dr. Bethune and Mr. Weed, each stating the high claims of Dr. Riley to the position. On motion of Prof. Cook, seconded by Prof. Smith, Dr. Riley was elected by acclamation.

Prof. Smith nominated Prof. S. A. Forbes as 1st Vice-President of the Association. The nomination was seconded by Mr. Howard, and Prof. Forbes was elected by acclamation.

Mr. Weed nominated Prof. A. J. Cook as 2nd Vice-President of the Association. The nomination was seconded by Dr. Bethune, and Prof. Cook was elected by acclamation.

Prof. Cook then took the chair and the meeting was carried on under his presidency.

Mr. Howard nominated Prof. J. B. Smith as Secretary of the Association. The nomination was seconded by Prof. Hargitt, and Prof. Smith was elected by acclamation.

On motion of Prof. Smith, the President was authorized to appoint a committee of two to prepare such by-laws as may be deemed expedient, to be submitted for approval by the Association at its next meeting.

Prof. Cook appointed the Secretary and Mr. Howard as such committee.

On motion of Mr. Howard, it was resolved that the next annual meeting of the Association be held at the time and place where the Association of Agricultural Colleges and Experiment Stations next meets.

On motion of Prof. Smith, the Society then adjourned.

JOHN B. SMITH, Secretary.

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

The following paper is presented in order to get into shape the notes made by me at odd times for the five years last past. It includes, in the first place, all the references that I found to the species during that time, and such notes of synonymic interest as I have culled from the publications examined. It has also been my practice, as specimens came into my hands, to use such as were unfit for the cabinet, for purposes of study, and I have thus accumulated a great many notes, which I see no opportunity of using for some time to come, inasmuch as my studies on the *Noctuidæ* will probably fill very completely all the time I have for systematic work. To present these notes for the benefit of those having more time to follow these lines of study, and to rid myself of the accumulated slips and memoranda, I have put them into this form. As some of the species are not known to me in nature, and as the sequence in Mr. Grote's list is based on no natural characters that I have been able to discover, I have arranged them in alphabetical order for convenience of reference.

Family ARCTIIDÆ.

The essential characters of the family are : Ocelli present, vein 8 of secondaries arising from the sub-costal at some distance from base. The former peculiarity separates them from the *Lithosiidæ*, the latter from the *Noctuidæ*. Usually, there is an accessory cell, but there are numerous exceptions to this. Typically, the venation of primaries is Noctuidous, save that the internal vein is not furcate basally. This, however, is a weak character. The secondaries are also very much as in the *Noctuids*, save for the origin of vein 8, which in the *Arctiids*, arises from the sub-costal instead of from the base. A somewhat well marked and characteristic feature is found in the loop of primaries receiving the frenulum of the male secondaries. It is very distinct and definite, arising from the space between the costal and sub-costal veins, and generally in the form of a heavy rope or band, reaching to the median space, where it is coiled to form a distinct ring into which the frenulum is inserted. In the female the frenulum consists of a bunch of three or more fine bristles, which are received into a loop formed of crossed scales in the median space of primaries.

The front is flat, except in the *Cydosiinæ*, and the head is usually small. The tongue is variable, and quite often aborted or very weak. Thorax and abdomen are very variably developed. The antennæ furnish good characters for generic separation and sub-family groupings. They are sometimes very short, sometimes excessively long, and again moderate in length. In addition to what has been said of the venation it may be added, that two definite series are recognizable, based on the origin of vein 10 of primaries. In some genera it arises from the sub-costal before the end of the cell, in the others it is from the series at the end of the sub-costal. The legs afford good characters. The spurs of the middle and hind tibiæ are sometimes wholly or partly wanting, and sometimes the fore tibiæ are armed with spines or claws.

The genitalia will furnish excellent characters when studied. I have examined a number of species and find strong peculiarities. As the notes are too fragmentary and the characters need illustration as well as description, no reference is made to them.

Finally, it may be as well to disclaim completeness, either of references or description, though so far as the bibliography is concerned it is much more complete than anything heretofore presented.

Sub-family CYDOSIINÆ.

The characters of this sub-family have been given by me in the Proc. U. S. Nat. Mus., 1888, pp. 185-190. The produced tuberculate or roughened front constitute the isolating character. Vein 10 of primaries is from the sub-costal.

Genus CYDOSIA, Westw.

1841—Westw. in Jardine Nat. Lib., XXXVII, 193.

1854—Wlk., C. B. Mus. Lep. Het., II., 523.

1885—Moeschl., Stett. Ent. Zeit., XXXXVI., 206.

1888—Smith, Proc. U. S. N. Mus. XI., 187.

C. nobilitella, Cram.

1782—Cramer, Pap. Ex., III., pl. 264, f. G., *Tinea*.

1816—Hübner, Verz., p. 168, *Crameria*.

1841—Westw. in Nat. Libr. 37, p. 193, *Cydosia*.

1854—Wlk., C. B. Mus. Lep. Het., II., 523, *Cydosia*.

1866—H.-Sch., Corr. Blatt., XX., 119, is an *Agaristid*.

- 1869—Grt. and Rob. Tr. Am. Ent. Soc., II., 186, *Cydosia*.
 1872—Stretch, Zyg. & Bomb., 162, pl. 7, f. 8, *Cydosia*.
 1882—Smith, Proc. U. S. N. Mus., XI., 188, *Cydosia*.
 imitella, Stretch.
 1873—Stretch, Zyg. & Bomb., 163, et. 242, pl. 7, f. 8, *Cydosia*.
 1873—Grt., Bull. Buff. Soc. N. Sc., I., 36, *Aurivitta* ?
 1888—Smith, Proc. U. S. N. Mus. XI., 188, pr. Syn.
 var. *aurivitta*, Grt. & Rob.
 1869—Grt. & Rob., Tr. Am. Ent. Soc., II., 186, pl. 3, f. 68, *Cydosia*.
 1872—Stretch, Zyg. & Bomb., 163, pl. 7, f. 9, *Cydosia*.
 1888—Smith, Proc. U. S. N. Mus., XI., 188, an var. pr.

The relation of these forms to each other is fully discussed in my paper in Proc. U. S. N. Mus., above cited.

The species from Texas.

Genus CERATHOSIA, Smith.

- 1887—Smith, Entom. Amer., III., 79.
 1888—Smith, Proc. U. S. N. Mus., XI., 189.

C. tricolor, Smith.

- 1887—Smith, Ent. Amer. III., 79.
 1888—Smith, Proc. U. S. N. Mus., XI., 190.

The recent discussion on the location of this genus is not referred to. Vein 5 of secondaries is very faint, but yet distinctly present. In my original description, made from a fresh slide, the thin balsam had obliterated the vein. The ease with which such errors are made in the venation is illustrated by the fact that ever since Herrich-Schaeffer first used venation as a basis for family characters, *Ino* has been credited with three internal veins, by even the best European students. I was the first to demonstrate by bleaching the wings and mounting in balsam, that one of these veins was a mere fold; on the other hand, this method has the disadvantage of obscuring the recognition of weak veins, and I was caught napping in this genus. My figures of venation in the Proc. U. S. N. Mus., are from camera drawings, and vein 5 was not apparent there. The presence or absence of the vein, is, however, immaterial so far as any influence over the family reference is concerned.

The species is from Texas.

Sub-family ARCTIINÆ.

This term as here used embraces all the other *Arctiide*. I wish to say definitely, however, that I believe we have here at least three good sub-families, and the term is used here simply to separate off the *Cydosiinæ*, which have been properly limited.

Mr. Hy. Edwards uses the term *Pericopidæ* for the genera *Gnophæla* and *Melanchroia*, in Ent. Amer., III., 227, placing them between the families *Lithosiidæ* and *Arctiide*. Mr. Grote, in his "New List," placed *Gnophæla* between *Ctenucha* and *Harrisina*; genera, with which it has not even a habitual, much less a structural resemblance, *Melanchroia* he omits altogether. I do not adopt Mr. Edwards's suggestion because I have not studied *Melanchroia*, and cannot find any satisfactory limit from *Gnophæla* alone. The group is rather tropical than temperate, *Gnophæla* being from the southwest and west, and *Melanchroia* still more typically southern—Key West, Mexico, Texas, Arizona. I place the two genera at the head of the series, on account of their *Lithosiid* tendencies.

Genus GNOPHÆLA, Wlk.

1854—Wlk., C. B. Mus. Lep. Het., II., 331.

1872—Stretch., Zyg. & Bomb., 35.

Omoiala, Grote.

1863—Grt., Proc. Ent. Soc., Phil., II., 334.

Lamprosina, Grote.

1863—Grt., Proc. Ent. Soc., Phil., II., pl. 6, f. 1.

Callalucia, Grote.

1866—Grt., Proc. Ent. Soc., Phil., IV., 315.

The ocelli are present, the eyes small, round and prominent, and the head as a whole, small. Tongue rather long and strong, palpi slender, drooping, with loose thin vestiture. Antennæ elongate, in the male heavily and lengthily bipectinated. Legs, subequal, smoothly scaled, the usual spurs small. Primaries with 11 veins, one of the series from the end of the sub-costal wanting, 3, 4 and 5 are from the median at the end of the cell, 5 rather close to 4, cell closed by a curved vein: 6 from the end of the subcostal on a very short stalk with 9, which runs to the apex and gives off one vein about half way to tip. Vein 10 is from the sub-costal before the end of the cell. Secondaries with 3 and 4 on a stalk from the end of the cell; 5 from a short spur cross vein, not far from the

stalk originating 3 and 4 ; a curved continuation of the cross vein closes the cell ; 6 and 7 on a long stalk out of the end of the subcostal, the stalk forking about half way to the margin ; 8 out of the subcostal about one-third from base.

The above notes are from a male, *G. hopfferi*. The exact relation of the very variable forms of the species is not at all settled, and there may be more or fewer species than are now recognized.

G. hopfferi, Grt. & Rob.

1867—G. & R., Tr. Am. Ent. Soc., I., 332, *Gnophæla*.

1872—Stretch,* Zyg. & Bomb., 38, 236. pl. 2, f. 2, *Gnophæla*.

1881—Butler, Papilio, I., 129, *Gnophæla*.

1882—Stretch,* Papilio, II., 82, *Gnophæla*.

var. *discreta*, Stretch.

1876—Stretch, Lep. Wheelers Exp., V., 802, *Gnophæla*.

arizonæ, French.

1884—French, Papilio, IV., 2c, *Gnophæla*.

1884—French, Papilio, IV., 112, = *discreta*.

Stretch gives the food plant as *Myosotis*. The insect has been taken in California, Arizona and Oregon (May 7 to June 1).

G. latipennis, Bdv.

1852—Bdv., Lep. Cal., Ann. Soc. Ent. Fr., 2nd ser., v. X., 320, *Glaucopis*.

1862—Morris, Synopsis Lep., 136, *Glaucopis*.

1872—Stretch, Zyg. & Bomb., 38, = *hopfferi*.

1882—Grote, New List 14, on sp. dist.

Habitat—California.

It is highly probable that Mr. Stretch is correct in referring *hopfferi* to this species ; but as Mr. Grote still lists them as distinct, and I have not studied the forms myself, I follow Mr. Grote for the present.

G. vermiculata, Grote.

1863—Grt., Proc. Ent. Soc., Phil., II., 334, pl. 6, f. 1, *Omoiala*.

1865—Grt., Proc. Ent. Soc., Phil., IV., 316, *Callalucia*.

1867—G. & R., Tr. Am. Ent. Soc., I., 332, *Gnophæla*.

* This sign, whenever used with a reference, as above, indicates that the early stages were referred to.

1872—Stretch, Zyg. & Bomb., 36, pl. 2, f. 1, *Gnophæla*.

1881—Butler, Papilio, I., 130, *Gnophæla*.

1888—Bruce,* Ent. Amer., IV., 24, *Gnophæla*.

var. *continua* Hy. Edw.

1881—Edw., Papilio, I., 80, *Gnophæla*.

Habitat, Colorado.

Mr. Bruce gives the food plant as *Mertensia virginica*, and the date in the Upper Platte Canon as July. The probabilities are that the species is double brooded, the first brood appearing in May, the larva of the second in July, imago late in July and early August.

Genus MELANCHROIA, Hübner.

1816—Hübner, Verzeichniss, 173.

1854—Walker, C. B. Mus. Lep. Het., II., 386.

1862—Clemens in App. to Morris Syn., 297.

This genus I have made no study of, although there is considerable material in the National Museum available for that purpose. Mr. Grote never included the genus in his lists and apparently considered it extra territorial. It is only within quite recent years that it has been placed by Mr. Edwards among the genera of our fauna, though Mr. Stretch recorded it in 1876 as found in Arizona. It is really a stranger to the rest of our fauna—an intruder from Central America—but it seems necessary to include it.

The bibliographical references to the older authors are all at second-hand, as, at the time I was studying their works and making notes, the species were not recognized as belonging with us. This is, perhaps, a good place to mention that, except where otherwise stated, all the references have been verified, and, barring errors in transcription and type, are correct.

M. cephise, Cramer.

1782—Cram., Pap. Ex., IV., 182, pl. 381, f. E., *Phalæna*.

1816 (?)—Hübner, Samml. Ex. Schm., II., Spbing, 17, ff. 1-4.

1816—Hübner, Verzeichniss, 173, *Melanchroia*.

1854—Wlk., C. B. Mus. Lep. Het., II., 387, *Melanchroia*.

1862—Clem., App. to Morris Syn., 298, *Melanchroia*.

1886—Edw., Ent. Amer., II., 9, *Melanchroia*.

Habitat—Texas, Arizona, Mexico, West Indies.

M. geometroides, Walker.

1854—Walk., C. B. Mus. Lep. Het., II., 357, *Melanchroia*.

1886—Edw., Ent. Amer., II., 9, *Melanchroia*.

Habitat—Key West, Fla., West Indies.

There are quite a number of specimens of what I take to be this species, in the National Museum, from the Morrison collection, but they have not been as yet incorporated into the systematic series.

M. inconstans, Geyer.

1837—Hüb., Zuträge, No. 431, ff. 861-862, *Melanchroia*.

1854—Wlk., C. B. Mus. Lep. Het., II., 389, (?) *Melanchroia*.

1860—Clem., App. to Morris. Syn., 298, *Melanchroia*.

1876—Stretch., Rept. Lep. Wheeler Exp., V., 802, *Melanchroia*.

secreta, Wlk., Cat. Lep. B. M., 222, supp., *Ardonia*.

1876—Stretch, Rept. Lep. Wheeler Exp., V., 802, pr. syn.

Habitat—Mexico, Arizona.

The synonymy is from Stretch, as are the bibliographical references to Walker.

Genus DARITIS, Walker.

This is also a recent addition to our fauna, made by Mr. Edwards. The Mexican form is not uncommon in its home, but the variety described by Mr. Edwards seems rare; at all events there have been very few specimens brought in. I have made no notes on this genus.

D. thetis, Klug.

1836—Klug., Neue. Schmett., IV., f. 1 and 2, *Euprepia*.

1886—Edw., Ent. Amer., II., 165, *Daritis*.

var. *howardi*, Edw.

1886—Edw., Ent. Amer., II., 165, *Daritis*.

Habitat—New Mexico, southward.

I have given none of the bibliography for the original species, as Mr. Edwards's description covers both species and variety.

From this point the order observed in Mr. Grote's list of 1882 is followed, not from any conviction that it is the best arrangement, but because it is easiest, and because for the present purpose any order will answer equally well.

(To be continued.)

OBSERVATIONS ON SOME NORTHERN DERBIDÆ.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

(Continued from page 159.)

Otiocerus Wolfii, Kirby. A pale specimen of this frail little form was beaten by me from a beech tree September 3, 1888, at Lancaster, N. Y., and Mr. Uhler has kindly sent me a fully colored individual, presumably from Md., taken on the 6th of August. The antennæ in this species are very short, with a single appendage.

Otiocerus Signoreti, Fitch. I am indebted to Mr. W. J. Palmer, jr., for an example of this species, captured at Lancaster, September 14, 1888. It agrees with *Wolfii* in having but one appendage to the rather small antennæ. The white wings are faintly tinted with red and beautifully veined with the same color.

Amalopota, new genus.*

Form very slight. Head rather short, horizontal above, almost vertical before, with superior and frontal keels about as in *Anotia*; apex obtuse. Eyes of medium size, emarginate below. Ocelli two, distinct, placed below and very near the inferior angles of the eyes. Antennæ about as long as the head, situated at the base of the clypeus in a socket formed by a sharp, slightly elevated ring; basal joint very short and annular; second joint diverse in the two sexes; in the male, much flattened, with the sides almost parallel; in the female, shorter and slightly flattened; in both sexes papillated, with a subterminal emargination, from which springs a bristle. Clypeus triangularly ovate, convex. Rostrum long, reaching to about the middle of the venter; terminal joint very short. Prothorax linear above, produced in an acute angle between the eyes; on the sides, suddenly expanded to a broad, thin scale. Humeral scales large and prominent. Legs slender, unarmed, of medium length; the posterior femoræ somewhat thickened; posterior tarsi three jointed; basal joint longer than the second and third united. Elytra long and narrow, widest at the inner apical angle; apex broadly rounded, a little retreating posteriorly; the costal area expanded near the base into a broadly rounded, slightly recurved lobe; a slight constriction of the costa just before the apex, with a thickening of the veins there, produces the appearance of an imperfect stigma. Venation simple,† almost as in

* From:—*αμαλός* feeble, and *πότη* flight.

† For convenience of comparison I have used Mr. Westwood's nomenclature of the venation.

Anotia ; costal area rather broad ; mediastinal vein forked at the basal third ; costal branch sending about two veinlets to the costa in the stig-matal region, and united by a cross vein to the outer fork of the inner branch, which is straight and twice forked just before the apex. Post-costal vein joining the mediastinal near the base and running straight to the apex of the elytra, parallel to the inner branch of the mediastinal vein; the long, straight cell thus formed is crossed by two veinlets, one at the apical third, the other near the apex. A cross vein joins the post-costal with the median vein near the middle of the elytra, beyond which the former sends five branches to the inner apical margin, the basal two of which are themselves forked near their apex, and united by a zigzag submarginal vein that reaches the claval suture ; at this submarginal vein terminate the anal and the two branches of the median vein. The apical forks of the post-costal vein are united by slender cross veins, which with this submarginal vein form a series of about twelve apical and marginal areoles from the semi-stigma to the clavus. Wing :—Mediastinal vein simple, near the costa, which it touches at about the middle ; post-costal vein bifid before the apex, and united by a cross vein to the mediastinal and median veins, the latter of which is also bifid. Abdomen short and broad, with a dorsal carina ; showing five segments above and four beneath.

The vertex and front are so compressed into the superior and frontal keels that they might not improperly be described as wanting. These keels, as in *Anotia*, are united on the front and divergent posteriorly on the vertex, the included space being cut out to receive the pronotum. The mesonotum is convex and lozenge-shaped, the length scarcely greater than the width, which greatly exceeds that of the head ; with three dorsal carinæ. Four anterior coxæ long and slender, placed obliquely ; posterior short and thick. Base of the femoræ approximate. The genital pieces scarcely differ from those of *Otiocerus*.

This genus differs from *Anotia*, to which it is perhaps most nearly related, by the presence of ocelli, the greater length of the rostrum, the smaller number of veins in the stig-matal region, etc. ; from *Patara* by the presence of ocelli, the greater length of the rostrum, the shape of the head and thorax, and the venation ; from *Mysidia* and *Derbe* (Westw.), it differs in the single frontal carina, in the shape and venation of the wings and the form of the eyes, but agrees with the latter genus in the

presence of the costal constriction (although less pronounced), and the length of the rostrum. The only genus described by Stal to which it need be compared is *Hulcita*, from which it is sufficiently differentiated by the presence of ocelli, the form of the vertex, antennæ, etc.

Amalapotia Uhleri n. sp. Pale sanguineous. Elytra transparent, with the basal third and a broad band before the apex fuscous, the latter marked with sanguineous toward the costa. Whole insect, when fresh, covered with a white bloom, most conspicuous on the face and abdomen. Length—To tip of abdomen 3 m.m., to tip of elytra 8 m.m.; expanse of wing 15 m.m. Head—Keels of the front and vertex, viewed from the side, gently and regularly arcuated; vertex narrow, almost entirely cut out between the keels to receive the pronotum, which extends forward nearly to the middle of the eyes; extension of the frontal keels before the eye a little less than the width of the eye in the female, about half the width of the eye in the male. Rostrum extending to the third ventral segment, the last joint scarcely longer than wide. Antennæ of the female reaching to the tip of the head; second joint somewhat compressed, a little widened at the apex, which is obliquely and concavely truncated for the reception of the seta; in the male this second joint is a little longer and wider than in the female, and is much compressed, with the margins slightly thickened and the surface more distinctly papillated; a minute notch, almost at the end, bears a bristle a little longer than the width of the joint. In fresh examples, the *Ocelli* are liable to be obscured by the white bloom on the cheeks.

Thorax—Prothorax widened to an almost quadrangular scale behind the eye; central carina of the mesonotum inconspicuous; lateral carinæ almost obsolete. Elytra, when closed, extending about two-thirds of their length beyond the abdomen; basal lobe-like tooth minutely denticulate on its edge.

General color sanguineous. Head, thorax and antennæ fulvous, the latter suffused with pale sanguineous within the margin in the male; this color also invades the frontal keel, especially in the female. Keels of the vertex crested with white. Eyes dark brown. Clypeus pale fulvous. Rostrum white, tip black. Legs clear whitish, the posterior femoræ more or less invaded with sanguineous. Coxæ fading and white toward their tips. Abdomen in the male sanguineous, the basal ventral segments paler; in the female deep sanguineous, or even brownish-purple, darker

along the crest ; posterior edge of the ventral segments and genital pieces pale, the valves above fulvous.

Elytra transparent ; basal third smoky-brown, omitting the humerus and costal region ; a broad brown band occupies the apical third of the costa, and narrows to about one-half this width at the internal apical angle ; this band includes a clear spot on its costal base, and omits about six of the apical areoles. In the female, this costal, clear spot is much larger than in the male, and coalesces with the clear, apical areoles. The veins are sanguineous within the limits of the brown, apical band, and in the stigmatal region are broadly bordered with the same color ; this color also appears in the veins of the basal brown patch in deeply colored examples. Wings clear, with a smoky tip, and a larger, slightly suffused, area at the base.

Described from five individuals—a pair taken *in coitu* Sept. 3rd, 1888, two females taken the same day, and another female taken by W. J. Palmer, Jr., of this city, a week later, all at Lancaster, N. Y. Three of these were beaten from maples, and two from uncertain trees—probably maple or beech.

I take pleasure in dedicating this beautiful little species to our leading American Hemipterist, Mr. P. R. Uhler, whose disinterested and unfailing kindness has been an inspiration and help to me in my studies of these insects.

CORRESPONDENCE.

GRAPTA J-ALBUM.

Dear Sir : Having heard that the larvæ and food-plant of *Grapta j-album* were unknown, I thought that I should do well in informing you, since you could best make known my little discovery, that I have bred the butterfly from young larvæ, which fed on silver birch (*Betula papyrifera*). Not knowing what they were, I neglected to make a long or careful description of them ; nevertheless, I hope the following observations may be of some value :—The larvæ were black, with two dorsal, two sub-dorsal and two super-stigmatal rows of white spots and smudges, three or four on each segment,* with one dorsal and two sub-dorsal rows of shining black, branching spines ; two super-stigmatal rows tipped with red, and two sub-

* There were also other smaller white spots scattered over the body.

stigmatal rows pale red. Underneath yellowish-green, and in some places reddish, speckled with white; 12th segment reddish, both above and below; head black, and covered with many hard, white, conical tubercles, or short spines; somewhat cordate, with two thick, black, branching spines at the upper corners like horns. The chrysalids were about one inch long, pale green or light brown, sometimes with a reddish tinge, with two sub-dorsal rows of tubercles, eight in each row, the first six of these being bright, shining silver (in some lights gold) in colour. Like the other *Grapta* chrysalids, they were suspended by a button of silk at the tail. Before the imago appeared, the colour and venation of the wings could be seen through the transparent outer covering. I found them on the 26th of May, 1889, when they were about eight inches long. On the 9th of June, they were two inches long. They moulted three times, and their appearance remained almost unaltered. They hung themselves up on the 13th of June, being then about 2.25 inches long, and on the 14th transformed. The imago appeared on the 29th and 30th of June. I had altogether eight of these larvæ. The following is a description of a variety of the same larvæ taken at a later date:—On the 16th of June, I found the larva feeding, like the former batch, on the silver birch. Length about one inch. On the 17th it moulted, after which it was 1.5 inches long; colour purplish white and amber, with a dorsal band of white clouds, and some on the sides; white underneath; one dorsal, two sub-dorsal, two super and two sub-stigmatal rows of branching spines on segments 4 to 11, 2 to 11, 2 to 12 and 2 to 11 respectively. These spines were supported by tubercles, and the dorsal, sub-dorsal and super-stigmatal were black, except the last two super-stigmatal; the rest were yellow and white. Head somewhat cordate and pale white, with two black branching spines at the upper corners like horns, and covered with small conical tubercles; upper corners black, and a dark mark like an inverted V over the jaws. On the 23rd it moulted again, after which it was light green, with two dorsal bands, more or less distinctly separated, of white clouds, and some white lateral markings; spines black, except the super-stigmatal, which were brown and amber, and the sub-stigmatal, which were pale green and white; the spine tubercles were orange yellow; head white, and covered with small, white, conical spines; spiracles black. It was largest at the 7th segment, segment 1 being very small; length about 1.75 inch. The chrysalis (June 29th) was green, with a rosy tinge and rosy markings, and with two dorsal rows of tubercles, 16 in number, the first six being shining silver in colour; about one inch long, with a large dorsal lump and two smaller lateral ones, and two at the head; black markings on last segment. On the 9th of July the imago appeared. Note that in this, and in the former description, the head is *not* counted as the first segment.

PERCY M. DAWSON, Montreal.

Mailed September 6th.

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THE ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Annual Meeting of the Society was held in the lecture room of the new Biological Building of the University of Toronto, on Tuesday, September 3rd, 1889. The President, Mr. James Fletcher, of Ottawa, took the chair at 11 o'clock a.m. The following members were present:—Mr. E. Baynes Reed and Mr. J. M. Denton, London; Mr. J. Alston Moffat, Hamilton; Dr. Brodie, Dr. White, Masters O. and W. White, Mr. Gamble Geddes, Mr. A. Blue (Department of Agriculture), Toronto; Rev. C. J. S. Bethune, Port Hope; Mr. W. H. Harrington and Mr. R. Bell, Ottawa; Mr. H. H. Lyman, Montreal; Rev. T. W. Fyles, Quebec; Rev. W. A. Burman, Winnipeg; Mr. L. O. Howard, Assistant Entomologist, Department of Agriculture, Washington.

The minutes of the previous meeting having been printed and circulated among the members, reading of them was dispensed with, and they were duly confirmed.

The President then delivered his annual address, in which he referred especially to the chief insect attacks of the year. It will be printed in full in the Annual Report of the Society. A cordial vote of thanks for his able and interesting address was unanimously voted to the President on motion of Dr. Bethune, seconded by Mr. Reed.

In the discussion which followed Dr. Brodie stated that he had found several cereals injured by Thrips; he discovered what were probably the larvæ of Thrips feeding under the sheath on culms of grass, but when kept over night no specimens would be found in the morning. He and Professor Wright had examined the insects and came to the conclusion that they were Thrips. The larvæ were exceedingly difficult to mount for the microscope; if preserved in balsam they soon faded out and became useless, but better results followed the use of glycerine. He was satisfied that there are two broods in the year, the first being early in the season. This year, owing to dry weather, they were very abundant.

in waste places, and he found about one-half of the timothy destroyed by them ; after the rain set in the injury was very much reduced.

Mr. Geddes spoke of some variations in size that he had observed in the common yellow butterfly, *Colias philodice*, and expressed his opinion that the large specimens fed on clover and the small on lucerne.

Mr. Howard (of Washington) gave an account of the success which has attended the efforts of Dr. Riley and himself to introduce parasites of the Fluted-Scale insect (*Icerya purchasi* Maskell), a very destructive creature in California. This noxious insect had appeared very suddenly in the State, from where no one knew. Experiments were made upon it, and remedies proposed, but the cultivators did not seem to care to make use of them on their plantations. They then set to work to learn its life-history, and soon found that it came from Australia. They corresponded with Mr. Percy Crawford regarding it ; he found the insect in Australia, but it was not at all abundant ; they concluded, therefore, that it was kept in check by parasites. A dipterous parasite was found by Mr. Crawford. Their next proceeding was to send Mr. Koebele to Australia. He found the insect everywhere, and observed that it was very commonly parasitized. He then sent over about 15,000 living specimens of parasites ; these were liberated at Los Angeles. He also found a "Lady-bird" (*Coccinella*) feeding on the scale-insect, and sent several thousand of them. The result has not been satisfactory with the dipterous parasite, as it breeds too slowly, but one of the species of Lady-birds breeds most rapidly, and will no doubt keep the pest within due bounds. As an instance of this he mentioned that 400 Lady-birds were sent to one planter, Colonel Robins, in May last ; he thought from their satisfactory work that his orchard would be free from the pest by the close of the summer, but he afterwards wrote to say that on the 15th of August there was not one living scale-insect left. The experiment had been entirely successful. Mr. Howard also referred to the importation of the parasites in 1883 of the cabbage-butterfly, *Pieris rapæ*.

Dr. Bethune gave an account of his attempt to import from England many years ago the parasites of the wheat midge, and of the failure of the effort.

Dr. Brodie was strongly of opinion that noxious insects should be fought by means of parasites ; that this was the true scientific method,

and that the use of poisons was a grave mistake. He was very much gratified with the account of the methods adopted at Washington, and hoped that they would be developed to the utmost.

Mr. Fletcher, in reply, said that we could not possibly ignore the great value of poisons as remedies against noxious insects ; that it was absolutely necessary to use them until we can depend upon the parasites ; and that even if we had the parasites at work upon our destructive insects they might at any time be swept away through a mildew or blight, and we should be left at the mercy of the enemy. He had been in correspondence with Mr. Whitehead in England in order to procure the parasite of *Diplosis*, but unfortunately this gentleman was ill and unable to carry out the project. He had found nearly all the specimens of scale-insects (*Aspidiotus*) sent to him from British Columbia were parasitized, but had never found one affected in this way in Ontario.

Dr. Brodie thought that the farming community could never be brought to adopt scientific methods for the protection of their crops till they had suffered from a sweeping destruction. He referred, as an example, to the ravages of the wheat midge some years ago. In the County of York it wrought so much havoc that the wheat fields were deserted and left to the cattle ; a day's threshing would produce two bushels of midges and no grain. When their crops were all destroyed then they were willing to resort to remedies, chief among which were the employment of the "midge-proof wheat" for seed, a judicious rotation of crops, and planting too early or too late to suit the habits of the midge. The introduction of new varieties of wheat was the principal means of getting rid of the pest. He wished that the farmers might lose all their potatoes in order that they might be led by this severe lesson to give up the use of Paris green and adopt scientific means of saving their crops.

After some further discussion, in the course of which the value of various poisons, such as arsenical preparations, hellebore, kerosene, etc., in checking insect ravages was insisted upon, the subject dropped.

Dr. White exhibited to the meeting some cheap wood cuts in outline of botanical subjects that were used in illustration of popular articles in "School Work and Play," and recommended that something similar should be done in order to popularise entomology. He said that specimens were first photographed upon zinc plates instead of glass, and, in

this way, by a special process, blocks were prepared for the printer at a very trifling expense. The project was heartily approved of, and it was agreed on all sides that much valuable instruction might be disseminated in this way.

Mr. Burman related his experience of injury to cattle and dogs by flies in the Northwest, and asked whether fish-oil would be a remedy. In reply, Mr. Fletcher and Mr. Howard stated that fish and other oils and grease were effective, both in keeping off the flies and in healing the affected parts.

The meeting then adjourned till the afternoon.

AFTERNOON SESSION.

The report of the council, the audited financial statement of the Secretary-Treasurer, and the report of the Librarian were presented and read to the meeting, and, on motion, were duly discussed and adopted. Mr. Moffat spoke of the large amount of work and the great care which Mr. Reed had bestowed upon the library during many years past, and of the excellent position into which it was now brought. He moved that "The thanks of the Society be given to Mr. Reed for his services in the library, and that the Executive Committee be hereby recommended to consider the possibility of shewing, in some pecuniary way, their recognition of his labors." Mr. Geddes, in seconding the resolution, which was duly carried, referred in warm terms to Mr. Reed's efficiency and kindness in connection with the library. It was suggested, in the discussion that followed, that a catalogue of the books should be prepared, and that by-laws should be framed for the proper regulation of the library and the issue of books to members of the Society. Mr. Denton said that there were now about eleven hundred volumes in the library, many of them being very rare works on entomology and other departments of science; he thought it most desirable that members out of London should be enabled to know what books there were, and under what conditions they might borrow them. Dr. Brodie spoke of the great importance of having a complete catalogue made of all the libraries in Ontario, and said that he considered it a work that might very well be undertaken by the Provincial Government. Mr. Reed thought that we were still in too crude a state to publish a catalogue of the Society's Library, but we might

make a beginning by issuing lists of the books in its different departments. It was finally agreed to leave the matter in the hands of the Librarian.

Mr. Lyman read his report as delegate to the Royal Society of Canada. Mr. Reed, in reply to an enquiry, gave an account of what had been done during the past year with regard to the Society's rooms and collections; he stated that they had frequently been opened to the public, and that many very pleasant evenings had been spent among the microscopes, books and cabinets.

Mr. Reed drew the attention of the meeting to the changes in "The Agricultural and Arts Act," affecting the Society, made during the last session of the Ontario Legislature, and moved, seconded by Dr. Bethune, "That in accordance with the provisions of section 67 of the Agricultural and Arts Act, as amended in 1889, the agricultural divisions in Schedule A of the said Act be grouped into the following five divisions, for the purpose of electing one person from each of said five divisions (who shall be a resident of the district he represents) as directors of the Entomological Society of Ontario:—

Division 1, to comprise Agricultural Divisions 1, 2, 3.				
" 2,	"	"	"	4, 5, 13.
" 3,	"	"	"	6, 10.
" 4,	"	"	"	7, 8, 9.
" 5,	"	"	"	11, 12.

And that this grouping of the Divisions be in force until otherwise altered or re-arranged at any annual meeting of the Society."—*Carried.*

The following gentlemen were elected officers for the ensuing year:—

President—Rev. C. J. S. Bethune; M. A., D. C. L., Port Hope.

Vice-President—E. Baynes Reed, London.

Secretary-Treasurer—W. E. Saunders, London.

Librarian—E. Baynes Reed, London.

Curator—Rowland Hill, London.

Directors—Division 1—W. H. Harrington, Ottawa.

" 2—J. D. Evans, Sudbury.

" 3—Gamble Geddes, Toronto.

" 4—J. Alston Moffat, Hamilton.

" 5—J. M. Denton, London.

Editor of the CANADIAN ENTOMOLOGIST—Rev. Dr. Bethune, Port Hope.

Editing Committee—James Fletcher, Ottawa ; J. M. Denton, London ; Rev. T. W. Fyles, Quebec ; Dr. Brodie, Toronto.

Delegate to the Royal Society of Canada.—H. H. Lyman, Montreal.

Auditors—J. M. Denton and E. B. Reed.

Mr. Moffat, who had been engaged for some time past in re-arranging the Society's collections, spoke of the desirability of printing a new list of Lepidoptera for labelling purposes. Dr. Bethune said that he did not think it advisable to do so just now, as the nomenclature of the order must be considered to be in a somewhat transition state ; he thought that after Mr. Scudder's magnificent work on the butterflies was completed, and students had time to master its contents, there would be a very general adoption of many, at any rate, of his generic titles, and that this would alter very much our current nomenclature. He also referred to Prof. J. B. Smith's contemplated monograph of the Noctuidæ, the frequent descriptions of new species by Mr. Hülst and others, and the work of Prof. Fernald among the Micros, as rendering the publication of a list premature at present. He said that he had in his possession a new check-list of the Noctuidæ by Mr. Grote, but its publication was deemed unwise owing to the foregoing considerations. He thought that Mr. Moffat's object could be met by printing a few sheets to supplement the lists published a few years ago by Dr. Brodie and Dr. White.

Papers were then read by (1) Dr. Brodie, on "Gall Insects ;" (2) the Rev. T. W. Fyles, "Some notes on the Effects of Heat on Insect Life ;" (3) Dr. Goding, "In Memoriam : George John Bowles." These papers will be published in full in the Annual Report.

The Rev. W. A. Burman, of Winnipeg, was elected a member.

After spending some time in the examination and discussion of various specimens brought by members, the meeting adjourned to meet in London next year.

ERRATUM.—In the description of the larva of *Grapta j-album*, by Mr. P. M. Dawson, in the September number, there occurs the obvious mistake (page 180, line 12) of "eight inches long" instead of ".8 inch."

A NEW CLOTHES BEETLE.

BY PROF. A. J. COOK, AGRICULTURAL COLLEGE, MICHIGAN.

One of the most interesting studies of the scientific entomologist—more interesting because of its economic importance—relates to variation of habits of insects, consequent upon variation in their environment. The carpet beetle, *Anthrenus scrophulariæ* Linn., feeds on flowers in its native Europe. In the new atmosphere of America, it feeds and thrives upon carpets, shawls and other woollen goods. The apple maggot, *Trypeta pomonella*, feeds upon our wild haw and other wild fruits. Civilization exterminates its old-time aliment; and it betakes itself to our apples, cherries and plums. The curculio, apple-tree borers, bark lice, etc., are other illustrations of the same truth.

In the past season I have discovered another illustration in the *Lasioderma serricorne* Fab. This insect belongs to the family *Ptinidæ*, a small family of very small insects. Very few of the insects of this family are noxious; the two best known of which are, the apple-tree twig borer, *Amphicerus bicaudatus* Say., which bores in the mature state in the twigs of the apple, and *Linoxylon basilaræ* Say, which attacks the hickory and grape. The insect in question, *Lasioderma serricorne* Fab., has been found to attack plush furniture. The larvæ, in this case, do the mischief; they perforate the plush, making it like a sieve. I know of several pieces of upholstered furniture utterly ruined by these minute larvæ.

The beetle is light-brown in color. There is little variation in the color, except that the eyes and tips of the elytra are black. The wing-covers appear a little lighter, because of a covering of light hairs, which are more dense on the elytra than on the thorax and head. The thorax bends down, so that, as we look from above, we can not see the head. The serrate antennæ, which give its name to the beetle, are also bent under the head, so as to rarely show. The beetle is very small, hardly more than 2 m.m. long. The elytra are non-striated. The first two joints of the antennæ are small. They then increase to the sixth, and then decrease to the end. The tenth, or last joint, is rounded. The grubs are short, curled and hairy. They are two m.m. long and one thick. The color is white, and the hairs nearly white. These latter have a slightly yellowish tinge. The six thoracic legs are tipped with black. The upper part of the head shows four yellowish-brown lines. The upper ones are

narrowest, while the lateral ones are abbreviated behind. The front of the head is brown, while the jaws and other mouth parts are nearly black.

Like all insects, these beetles, both as larvæ and imago, are very susceptible to gasoline or bi-sulphide of carbon. Both of these, used in large quantities, were quickly fatal to the insects. Like the carpet beetle, they infest upholstered furniture between the folds, especially where the back joins the seat. It is easy to drench such parts of a sofa or chair with gasoline and destroy the larvæ of either moth or beetle.

Nearly every year brings examples of such change of habits as described above. Such incursions, present and prospective, emphasize the importance of thoroughly-trained entomologists in every state of our country.

THE NOCTUIDÆ OF EUROPE AND NORTH AMERICA.

(*Third Paper.*)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Agrotini*.

The tibiæ are usually all spinose, the eyes naked, the body untufted, the form normal, the male antennæ of various structure, pectinated, brush-like, simple. The European species are referred by Lederer all to one genus, *Agrotis* of Hübner. Nevertheless, I think the yellow-winged forms may well be separated under *Hiria* and *Tryphæna*. Of these yellow-winged forms, with flattened abdomen, we have only one *T. Chardinyi*, from Anticosti and Maine, considered identical with the Siberian species of the same name, described originally by Boisduval under *Anarta*. For the structure of *Agrotis*, I refer the student to a paper of mine on the genus, CAN. ENT., XV., 51. This genus seems of general distribution, although, perhaps, most numerous represented by species in North America. To this tribe, I would refer certain American genera, with few species, which seem peculiar. These are: *Carneades*, which differs by a frontal tubercle; *Richia*, which resembles *Ammoconia* in having a thoracic rigid tuft, but has simple antennæ; *Adita*, with a claw on front tibiæ; *Agrotiphila*, with narrowed eyes; *Anytus*, with lashes; the peculiar genus *Ufeus*, and, finally, *Copablepharon*, which has some

resemblances to the *Heliothians*, and superficially recalls *Arsilouché*. The position of some of these genera is debatable, and the immature stages almost entirely unknown. We may briefly compare the European and American representatives of *Agrotis*. In Europe, about 120 species are known; we have a preliminary list of over 200. Divisions of the genus into groups have been proposed on peculiarities of the genitalia, which seem convenient, but are probably of less importance than the armature; hence, I would prefer to divide the genus, primarily, into two groups, the species with unarmed fore-tibiæ, and those with all the tibiæ armed. When all the species are compared, there will probably be found peculiarities in the armature of the front tibiæ to warrant further divisions. The relationship of the American species to the European is evidenced by the identical forms, *i. e.*, *baja*, *ypsilon*, *plecta*, *sancia*, etc., then by the representative forms, *i. e.* *haruspica*, *phyllophora*, etc. The species from the west coast have largely a European facies; the Labrador species are found, with other Arctic forms, on the summit of Mount Washington. We may regard this genus as of very general, pre-glacial distribution; but evidently a greater number of species feed, in the larval condition, upon plants now found in temperate latitudes. Setting the question of the allied genera with mostly few species aside, the affinity of the two faunæ is quite evident. It is a little singular that the yellow-winged forms are so feebly represented in North America. Their presence gives a somewhat peculiar aspect to the European fauna. The occurrence of yellow-winged species is not unusual in the *Noctuidæ*. We find them in *Onocnemis*, *Hadena* and *Anarta* among usually fuscous species.

Tribe *Hadenini*.

Leaving the *Dicopid* genera, which seem peculiar, we now come to a group of typical Owlet moths, which differ from the *Agrotini* mainly in their usually unarmed tibiæ and tufted, rougher, body covering. In the first genera, the eyes are hairy; in *Fishia*, the tibiæ are spinose; in *Copimamestra*, the front tibiæ have a claw. This latter genus is founded for the European *brassica* and its American representative *occidentalis*. *Mamestra* is a typical Hadenoid genus with hairy eyes, and *Dianthæcia* merely differs by the external ovipositor. These two genera, or generic groups in our fauna, show a similar relation to the European fauna as with *Agrotis*. Whether our *trifolii* (*albifusa*) is identical with the European, may not be certain, but the genus has several representative species

such as *nimbosa*, *atlantica*, *subjuncta*, etc. In *Dianthæcia*, we have *D. bella*, which represents the European *D. Magnolii*. America has the usual preponderance of species, over seventy, while Europe has fifty-eight of the two together. In my lists I have not separated the forms of *Dianthæcia*, partly because the character was not easy to verify, or I had only males, while the pupa, which presents some peculiarities as studied in Europe, is quite unknown. Peculiar American Hadenoid genera, with hairy eyes, seem to be *Nephelodes*, *Admetovis*, *Tricholita*, *Trichoclea*, *Trichopolia* and *Eupsephopæctes*.

I would here draw attention to the fact, that the generic characters in the *Noctuide* and the moths generally are of such a nature that a difference of opinion may legitimately arise. Undoubtedly, an ultimate and better opinion may be obtained, but criticism is to be only indulged in with that moderation which the nature of the subject demands. Far different is it with matters concerning positive or actual structure, where the empiric has before him a certain specimen under the microscope. In such cases, as with the genus *Cerathosia*, where the describer erroneously describes the neuration or other actual features, a positive error is committed and the author earns that measure of opprobrium which belongs to defective work in Natural History.

The European Hadenoid genera, with naked and lashed eyes, *Episema*, *Thecophora* and *Dichonia* seem to be absent from our fauna. *Polia*, which has the antennæ tufted at base and usually pectinate or serrated in the males, has eleven European species; in the Bull. U. S. Geol. Surv., VI., 266, I have given the list of ten American forms referred here, whether they are all strictly correct, I am uncertain. The European genera, with few species, *Metopoceras*, *Cladocera*,³ *Heliphobus*, *Ulochlena*, *Oxytrypia*, are yet without described American species. Guenée's *Chariptera festa* seems to be the *Cerma cora* of Hübner, and not to be congeneric with the European *viridana*. Mr. Morrison's *Valeria Grotei* has a claw on the fore tibiæ; consequently is not congeneric with the European *jaspidea*, but seems to be allied to *Dicopis*.

The genus *Oncocnemis* is a smooth, almost Agrotid form, considered by Herrich-Schaeffer as allied to *Heliothis* with a claw on the front tibiæ, represented by two Russian species, of which *confusa* has a representative form in the Californian *Behrensi*. I have described the large number of nineteen American species (three having yellow secondaries, *Hayesi*,

Dayi and *mirificalis*), while other authors have added four; our most beautiful Eastern form being the *atrifasciata* of Mr. Morrison, which I refer to this genus, it being related apparently to the grey forms, such as *Chandleri*, *riparia*, etc., the median space filled with black. I refer two Western species to the European genus *Valeria*, *opina* and *conserta*, and one Eastern species, *stigmata*, to the European genus *Dryobota*. Peculiar American Hadenoid genera, with naked eyes, seem to be *Arthrochlora*, *Hillia*, *Homohadena*, *Pachypolia* and *Hadenella*. The typical genus, *Hadena* itself, seems to have a parallel representation in North America with the other leading genera *Apatela*, *Agrotis* and *Mamestra*, from which latter genus the species differ in having naked eyes. It offers both identical and representative species with the European forms, and again an excess in number, over sixty to over forty. The related genus *Hyppa* with its one European species has a representative American form *xylinoides*. I have identified the European *Dipterygia pinastri* as occurring in North America; whether this is a survival, or a more recent importation, is doubtful, perhaps the latter. Of the European genus *Actinotia*, we have two species; of *Callopietria*, one. A strong analogy of the two faunæ is offered by the genera clustering about *Euplexia*, the single species of which latter, *lucipara*, is found from the East to California, and is apparently an unchanged survival and identical with the European; I have found the larvæ on a number of plants, among them the common *Fuchsia*. These genera are *Trigonophora*, and *Brotolomia*, each with representative American forms, while the European genus *Habryntis* is perhaps not found in America, nor, conversely, the American genus *Conservula* in Europe. *Prodenia*, which has one European, has at least four North American species. This genus is a Southern form, intruding into the European fauna from the Mediterranean and Asia Minor; in America, more plentiful in the Southern States, where an allied form, the *Laphygma frugiperda* of Abbot and Smith, is destructive to corn. We have nothing like the wide-winged European *Mania maura*, so far as my knowledge goes. The determination of what species is the real type of the earlier genera of Ochsenheimer and other authors is a matter of some difficulty, owing to the fact that the species were loosely associated, and the characters we today consider of importance neglected. Not a single species included by Boisduval in 1829 under *Luperina* is placed under *Luperina* by Lederer. The true type of *Luperina* may, I think, be considered to be the Euro-

pean *testacea*, which Lederer includes under *Apamea* Tr. Probably the true type of *Apamea* may be found in *nictitans*, one of the original species.

Of neither *Luperina* Boisd. (= *Apamea* Led.), or *Ledereria* m. (= *Luperina* Led. non Boisd.), do I know American species. *Apamea nictitans* occurs with us however, from California to the East probably as an unchanged survival, not only in the typical, but also in the varietal European forms. Whether *nictitans* and certain allied species are distinct from *Gortyna*, I, however, doubt, and it is probable that we have but one genus which European authors call *Hydracia* Guen. Now the type of *Hydracia* is *micacea*, as cited in the Species Général. But the type of *Gortyna* is already designated by Hübner as *micacea*, consequently *Hydracia* must fall. For *Gortyna* Led., with its one species *flavago*, which differs from *Hydracia* by its mucronate clypeus, the term *Ochria* must be used, as I have pointed out. The objectors to Hübner must be told that Ochsenheimer cites him as authority, himself giving no diagnoses to the Noctuid genera; that the older Noctuid generic names are all incompletely founded, that there is no standard for exact generic definition, and finally, that Hübner has given us more information and a better classification for the *Noctuidæ* than any author before his time. Hübner separates the *Thyatirinae* correctly for the first time; he is the author of the leading generic divisions and names, *Apatela*, *Agrotis*, *Heliothis*, etc., names which have been wrongly credited to his successors. The North American species of *Gortyna* (including those separated by me with *nictitans*) are much more numerous than the European. The finest species is our beautiful *Gortyna speciosissima*. We have two species with mucronate clypeus; one from the East, *buffaloensis*, and another from the West. In ornamentation these species resemble the other *Gortynæ*, but we must refer them to *Ochria*, together with the European *flavago*. Our North American species which most nearly resembles the European *flavago*, is, however, my *Cataphracta*, but here the front is smooth. The question then arises as to the value of the frontal tubercle; whether it may not be developed as easily as modifications in the color or pattern of ornamentation. Such questions are beyond our present ability to answer. We must use what characters we find upon which to found our genera, but the difficulties which the subject presents should preclude all notion that our present opinions are infallible, or that we have any reasonable pretext to arrogate to ourselves a superiority in our classi-

fication which allows us to speak unduly and depreciatingly of those who studied these matters long ago.

As with former groups, the North American *Hadenini* show a prevailing affinity with the European fauna. The amount of divergence can hardly be shown until all the species are carefully compared, but we can be sure it will not outweigh the resemblance.

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 175.)

Sub-Family ARCTIINÆ.

In the previous paper I explained the sense in which this term is used, and nothing further in the way of definition need be said on that head.

Genus CROCOTA Hbn.

1816—*Verzeichniss*; Samml., Eur. Schm., III., 254.

This genus is in a sad state. It is almost impossible to identify species satisfactorily, and yet new species are constantly described. The matter has been further confused by Mr. Grote's persistent refusal to refer to Mr. Reakirt's species, for without referring them positively as synonyms to any species, he says he cannot believe that they refer to species different from those recognized by him, and therefore he ignores them altogether. This has had the effect of causing others to lose track of the descriptions which, poor as they may be, yet are necessary to be referred to. We know nothing at all as yet as to the range of variation in the genus, and species are based upon the most indefinite comparative features of colour and appearance.

Using *C. ferruginosa* as subject: The head is free, rather small; eyes large, somewhat prominent; ocelli distinct; vestiture scaly, smooth; antennæ of male with the joints marked, scarcely serrate, with fine lateral ciliæ, palpi moderate in length, straight or slightly drooping. Thoracic vestiture scaly. Legs closely scaled, posterior longest, the spurs normal—*i. e.*, middle with one, posterior with two pairs. The tongue is rather short, but corneous and spiral. Wings proportionately wide and short,

rather frail and thinly scaled, usually some shade of reddish or yellowish, more rarely tending to black. On the primaries, veins 7 to 10 inclusive are on a stalk out of the end of the cell, 10 thus not arising out of the subcostal, 3, 4 and 5 are almost equidistant from the end of the median. On the secondaries, 3 and 4 are from the end of the cell, 5 is wanting, 6 and 7 from a stalk out of the end of the subcostal, 8 from subcostal, about one-third from base. There may be some variation in the origin of 2, 6 and 7 of secondaries, and 5 may be present in some species; these are variable points in this family.

From what I have seen, I believe that almost any good local collection would show most of the species; in other words, I believe individual characters have been largely used for specific distinction.

C. aurantiaca Hbn.

1825—Hübner, Zutr., p. 9, ff. 411, 412, *Eubaphe*.

1855—Wlk., C. B. Mus. Lep. Het., II., 523, *Eubaphe*.

1862—Morris, Synopsis, 253, *Eubaphe*.

1864—Pack., Proc. Ent. Soc., Phil., III., 103, *Crocota*.

Habitat—"Georgia." Eastern and Middle States.

Packard apparently did not recognize this species. I am not sure that I have it correctly, but what I take to be the species seems to occur east of the Mississippi and north of the Carolinas.

C. belfragei Stretch.

1885—Stretch, Ent. Amer., I., 103, *Crocota*.

Habitat—Texas.

C. brevicornis Wlk.

1855—Wlk., C. B. Mus. Lep. Het., II., 536, *Crocota*.

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 542, *Crocota*.

1862—Morris, Synopsis, 255, *Crocota*.

1862—Clem. in App. to Morris' Syn., 308, *Crocota*.

1864—Pack., Proc. Ent. Soc., Phil., III., 104 *Crocota*.

1877—Butl., Tr. Ent. Soc., Lond., 367, *Eubaphe*.

Habitat—Can., Maine, N. Y., Mass., Ohio, Ills., Colo.

Apparently quite widely distributed. Butler says Walker had several specimens of this species among his *rubicundaria*.

C. costata Stretch.

1885—Str., Ent. Amer., I., 103, *Crocota*.

Habitat—Texas.

Apparently a very distinct species, which I have identified in the National Museum collection.

C. diminutiva Graef.

1887—Graef, Ent. Amer., III., 42, *Crocota*.

Habitat—Texas.

C. ferruginosa Walker.

1855—Walk.,* C. B. Mus. Lep. Het., II., 535, *Crocota*.

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 542, *Crocota*.

1862—Morris, Synopsis, 255, *Crocota*.

1862—Clem., in Morris Syn., App., 308, *Crocota*.

1864—Pack., Proc. Ent. Soc., Phil., III., 103, *Crocota*.

1867—Grt., Proc. Ent. Soc., Phil., VI., 313, *Crocota*.

1868—Bethune, CAN. ENT., I., 18, *Crocota*.

1877—Butl., Tr. Ent. Soc., Lond., 367, *Eubaphe*.

aurantiaca ‡ Harris.

1850—Harris in Ag. Lake Super., 393, *Eubaphe*.

1864—Pack., Proc. Ent. Soc., Phil., III., 103, pr. syn.

rubicundaria ‡ Walker.

1855—Wlk., C. B. Mus., Lep. Het., II., 536, *Crocota*.

1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, pr. syn.

Habitat—Canada to N. Y., west to the Mississippi, Lake Superior,
H. B. Terr., Maine.

The distribution is probably wider. It is quite uncertain what this species really is, and authors are not agreed. Butler says one specimen of Walker's *rubicundaria* is referable here.

C. fragilis Strk.

1879—Rept. Engin., 1878-79, V., p. 1859, *Crocota*.

Habitat—"Pagosa Springs," July 21.

This is almost certainly *Ameria unicolor*, if Mr. Strecker's description is good for anything.

C. immaculata Reak.

1864—Reak., Proc. Ent. Soc., Phil., II., 372, *Crocota*.

Habitat—Philadelphia, Pa.

* This sign, whenever used with a reference, as above, indicates that the early stages were referred to.

So far as I know this species has not been positively identified with any other.

C. intermedia Graef.

1887—Graef, Ent. Amer., III., 42, *Crocota*.

Habitat—Texas.

C. lacta Bdv.

1829—Bdv. in Guer. Icon. Ins., pl. 88, f. 6, p. 519, *Lithosia*.

1855—Walker, C. B. Mus. Lep. Het., II., 537, *Crocota*.

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 537, *Crocota*.

1862—Clem. in App. to Morris, Syn., 309, *Crocota*.

1864—Pack., Proc. Ent. Soc., Phil., III., 105, = *brevicornis*.

1877—Butl., Tr. Ent. Soc., Lond., 367, *Eubaphe*.

treatii Grote.

1865—Grt., Proc. Ent. Soc., Phil., IV., 322.

1882—Grt., New List 15, ? = *treatii*.

Habitat—Mass., N. Y., N. J., D. C.

I have in some way mislaid my notes on the figure in Griffith's Cuvier; that in Guerin I have never seen. My recollection is that the figure is on the same plate with that of *Callimorpha Lecontei* (pl. 32), and is the lower figure on the plate. I never had any doubt of its being the species afterward called *treatii* by Mr. Grote. Dr. Packard had evidently not seen this species when he hazarded the suggestion that this might be the same as Walker's *brevicornis*.

C. nigricans Reakirt.

1864—Reak., Proc. Ent. Soc., Phil., II., 371, *Crocota*.

Habitat—Philadelphia, Pa.

Unknown to me.

C. obscura Stretch.

1885—Stretch, Ent. Amer., I., 103, *Crocota*.

Habitat—N. H., Pa.

C. opella Grote.

1863—Grt., Proc. Ent. Soc., Phil., I., 345, *Crocota*.

1863—Grt., Proc. Ent. Soc., Phil., II., 30, pl. 2, f. 1.

1867—Grt., Proc. Ent. Soc., Phil., VI., 313, *Crocota*.

1877—Butl., Tr. Ent. Soc., Lond., 367, *Eubaphe*.

Habitat—Pa., N. Y., Can.

Butler says Walker included specimens of this species with his *rubicundaria*.

C. opelloides Graef.

1887—Graef, Ent., Amer., III., 42, *Crocota*.

Habitat—Texas.

C. ostenta Hy. Edwards.

1881—Edw., Papilio, I., 12, *Crocota*.

Habitat—Arizona.

C. quinaris Grote.

1863—Grt., Proc. Ent. Soc., Phil., II., 30, pl. 2, f. 2, ♀, *Crocota*.

1864—Pack., Proc. Ent. Soc., Phil., III., 105, *Crocota*.

1867—Grt., Proc. Ent. Soc., Phil., VI., 313, *Crocota*.

choriona Reakirt.

1864—Reak., Proc. Ent. Soc., Phil., II., 371, *Crocota*.

1864—Pack., Proc. Ent. Soc., Phil., III., 105, ? pr. syn.

1865—Grt., Proc. Ent. Soc., Phil., V., 234, pr. syn.

bimaculata Saunders.

1869—Saund., CAN. ENT., II., 51, *Arctia*.

1882—Grt., New List, pr. syn.

Habitat—Mass., Can., Pa., Colo. "8,000 ft."

C. rubicundaria Hübner.

1825—Hbn., Zutr., p. 28, 256, ff. 511, 512, *Crocota*.

1855—Walk., C. B. Mus. Lep. Het., II., 536, *Crocota*.

1860—Clem., Proc. Ac. Nat. Sci., Phil., XII., 541, *Crocota*.

1862—Morris, Synopsis, 256, *Crocota*.

1862—Clem., App. to Morris Syn., 307, = *Phrag. rubicosa*.

1866—H. Schaeff, Corr. Blatt, XX., 118, ?, = *aurantiaca*.

1867—Grt., Proc. Ent. Soc., Phil., VI., 313, *Crocota*.

1868—Bethune, CAN. ENT., I., 18, *Crocota*.

1877—Butler, Tr. Ent. Soc., Lond., 367, *Eubaphe*.

Habitat—Can., Mass., N. Y., Ga., Ills.

According to Butler, the *rubicundaria* of Walker is not Hübner's species, but seems a mixture of at least three other species.

Genus EMYDIA Boisd.

1829—Boisd., Ind., Meth.

This genus I know only in the European species, and from descrip-

tions by European authors. In appearance it is *Lithosii*-form, with rather narrow primaries and broad secondaries; the vestiture is close, smooth; vein 5 of secondaries is said to be wanting; fore-tibia unarmed; the spurs of middle and hind tibia normal. I do not remember the venation of primaries, and made no note as to the origin of vein 10.

E. ampla Grote.

1878—Grt., CAN. ENT., X., 232, *Emydia*.

Habitat—Colorado.

Genus *UTETHEISA* Hübner.

1816—Hübner, Verzeichniss, 168.

A well marked genus containing very handsome and extremely variable species, since it has been determined that all our forms are but varieties of one species. The head is distinct, free, eyes rather large, not prominent, ocelli distinct. The palpi are slender, ascending, reaching the middle of front, the terminal joint rather long, closely scaled. Antennæ moderately long, slender, simple in the ♀, in the ♂ the joints marked with single lateral bristles. Legs closely scaled, quite considerably longer posteriorly, all the spurs complete and moderate in length. Body closely scaled. Primaries with vein 10 out of the subcostal, a short cross vein connecting it with the stalk bearing 7, 8 and 9, and thus forming an accessory cell; 6 is from the end of the sub-costal; 4 and 5 are close together out of the end of the median; 3 somewhat remote from 4, but much nearer than to 6. Secondaries with 3, 4 and 5 very close together from the end of the median; 6 and 7 together from the end of the subcostal; 8 as usual about one-third from base out of the subcostal. Both *Crocota* and *Emydia* lack vein 5 of secondaries, which is a decided *Lithosiid* tendency; *Utetheisa* has 5 well marked, and has a distinct accessory cell, the relation to *Callimorpha* being obvious in the entire scheme of venation.

As the species are attractive as well as variable, the literature is voluminous, and yet I have given none of the "popular" or economic references.

N. bella Linne.

1758—Linn., Syst. Nat. Ed., X., 534, *Tinea*.

1767—Linn., Syst. Nat. Ed., XII., 885, *Tinea*.

- 1764—Linn., Mus. L. U., 399, *Tinea*.
 1770—Drury, Exot., I., 51, pl. XXIV., f. 3, *Tinea*.
 1775—Fabr., Syst. Ent., 585, *Bombyx*.
 1781—Fabr., Sp. Int., II., 203, *Bombyx*.
 1787—Fabr., Mant. Ins., II., 131, *Bombyx*.
 1791—Oliv., Encycl. Meth., V., 99, pl. 72, f. 10, *Bombyx*.
 1793—Fabr., Ent. Syst., III., p. 479, *Bombyx*.
 1793—Gmel., Ed. Linn. Syst. Nat., 2447, *Bombyx*.
 1816—Hübner, Verzeichniss, 168, *Utetheisa*.
 1837—Westwood, Ed. Drury, I., 46, *Deiopeia*.
 1841—Harris, Rept. Ins., Mass., *Deiopeia*.
 1841—Duncan, Nat. Libr., XXXII., 191, pl. 24, f. 1, *Deiopeia*.
 1855—Wlk., C. B. Mus. Lep. Het., III., 568, *Deiopeia*.
 1862—Morris, Synopsis, Suppl., 251, 313, *Deiopeia*.
 1862—Harris, Inj. Ins. Flint Ed., 342, pl. VI., f. 2, *Deiopeia*.
 1864—Pack., Proc. Ent. Soc., Phil., III., 105, *Utetheisa*.
 1865—Grt., Proc. Ent. Soc., Phil., V., 234, *Utetheisa*.
 1866—H.-Schaeff, Corr. Blatt, XX., 119, *Callimorpha*.
 1869—Bethune, CAN. ENT., I., 18, *Utetheisa*.
 1873—Stretch*, Zyg. & Bomb., 56, 236, pl. 2, f. 15, *Utetheisa*.
 1875—Saund., CAN. ENT., VII., 85, f. 1, *Deiopeia*.
 1877—Butler, Trans. Ent. Soc., Lond., 361, *Deiopeia*.
 1879—Hulst., Bull. Bkln. Ent. Soc., I., 83, *Deiopeia*.
 1883—Edw.* Papilio, III., 128, *Utetheisa*.
 1886—Moeschl., Ent. Amer., II., 75, *Utetheisa*.
 1887—Gundlach, Cont. Ent. Cuba, 257, *Utetheisa*.
 var hybrida Butler (between *bella* and *ornatrix*).
 1877—Butl., Trans. Ent. Soc., Lond., 361, *Deiopeia*.
 var. ornatrix Linn.
 1758—Linn., Syst. Nat. Ed., X., 511, *Noctua*.
 1767—Linn., Syst. Nat. Ed., XII., 839, *Noctua*.
 1764—Linn., Mus. L. U., 384, *Noctua*.
 1770—Drury, Exot., I., 51, pl. 24, f. 2, *Noctua*.
 1775—Fabr., Syst. Ent., 586, *Bombyx*.
 1779—Cram., Pap. Exot., II., 107, 108, pl. 161, ff. C, D, F, *Phalaena*.
 1781—Fabr., Sp. Ins., II., 203, *Bombyx*.
 1787—Fabr., Mant. Ins., II., 131, *Bombyx*.

- 1791—Oliv., Enc. Meth., V., 100, *Bombyx*.
 1793—Fabr., Ent. Syst., III., 1, 479, *Bombyx*.
 1816—Hbn., Verzeichniss, 168, *Utetheisa*.
 1820—Hbn., Samml. Ex. Schmett., II., pl. 394, *Utetheisa*.
 1837—Westw., Ed. Dru., I., 46, pl. 24, f. 2, *Deiopeia*.
 1855—Walker, C. B. Mus. Lep. Het., III., 567, *Deiopeia*.
 1856—Lucas in Sagra's Cuba, 301, *Deiopeia*.
 1865—Grt., Proc. Ent. Soc., Phil., V., 234, pr. var.
 1873—Stretch, Zyg. & Bomb., 58, pl. 2, f. 18, *Utetheisa*.
 1877—Butler, Trans. Ent. Soc., Lond., 361, *Deiopeia*.
 1886—Moeschl., Ent. Amer., II., 75, *Utetheisa*.
 var *intermedia* Butler (between *bella* and *speciosa*).
 1877—Butl., Tr. Ent. Soc., Lond., 361, *Deiopeia*.
 var *speciosa* Walk.
 1855—Wlk., C. B. Mus. Lep. Het., III., 568, *Deiopeia*.
 1862—Morris, Synopsis Suppl., 314, *Deiopeia*.
 1865—Grt., Proc. Ent. Soc., Phil., V., 234, pr. var.
 1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, pr. var.
 1873—Stretch, Zyg. & Bomb., 57, pl. 2, f. 16, *Utetheisa*.
 1877—Butl., Tr. Ent. Soc., Lond., *Deiopeia*.
 1886—Moeschl., Ent. Amer., II., 75, *Utetheisa*.
 bella ‡ Cram.
 1779—Cram., Pap. Ex., III., 20, pl. 109, ff. C and D, *Phalaena*.
 1886—Moeschl., Ent. Amer., II., 75, = *speciosa*.
 Habitat—Can. to D. C., Ga., west to Miss., Ia., Mo., for *bella*
 varying to *ornatrix* in Tex., Mex., Fla., West Indies, where
 also *speciosa* occurs.
 Recorded food plants are *Crotalaria*, *Lupin*, *Prunus*, *Lepedeza*,
 Ulmus.

Few species have greater bibliography, and, as already hinted, it is far from complete.

Mr. Butler's paper in the Trans. Ent. Soc., London, for 1877, seems to have been lost sight of. Mr. Grote does not quote his varieties in his "New List," nor does Mr. Hy. Edwards, in his additions, Ento. Amer., March, 1888, refer to them.

(To be continued.)

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POPULAR AND ECONOMIC ENTOMOLOGY—No. 5.

THE TIGER-SWALLOW-TAIL (*Papilio Turnus*, L.)

BY JAMES FLETCHER, OTTAWA.

Just about the time the lilac bushes open their fragrant blossoms the grand insect shown at figure 9 may be seen either hovering over gardens and sipping the nectar of flowers, or sailing majestically down some woodland glade. It generally appears at Ottawa about the first of June,



Figure 9.

and may be seen for a month or more. Farther to the north it comes later, not appearing at Nepigon, north of Lake Superior, until the end of June. This insect has many characters which make it of interest to the collector. Its size and beauty make it a striking object in the spring landscape. Although it varies in abundance in different years, it is generally one of the first treasures of the young collector, and is prized accordingly. The variations it presents in different latitudes and the habits of its remark-

able caterpillar are of great interest to the student. In the north, including the whole of Canada, the males and females are like our figure, having the ground colour of a pale lemon yellow, with rich black markings. The broad margin is more or less powdered with blue scales, particularly on the hind wings, which are further ornamented with a conspicuous orange-red spot, bordered with black and blue, near the hind angle, and in the females there is another large spot of the same colour at the upper angle. In the Southern States the specimens of both sexes are larger and more highly coloured, and besides a black dimorphic form of the female also occurs. No specimen of a black male has ever been taken. The only approach to this melanic form is the beautiful suffused variety which is figured below. The range of the Tiger-Swallow-tail is very extended. I have some specimens from the arctic circle and others from the tropics, while from east to west it occurs from Newfoundland to Alaska. The eggs are laid by the females singly on the upper side of the leaves of its food plants. They are about one-twentieth of an inch in diameter, sub-globular and smooth, at first of a pale transparent green, much yellower at the base by reason of a more or less abundant waxy substance which fastened them to the leaf; after a few days they turn reddish, and just before the young larvæ hatch they are almost black. The time of hatching varies with the weather from ten to twenty days. The caterpillars are very different in appearance during their various stages. In the first stage the general appearance is black, with white spots and tubercles, and a conspicuous white saddle-shaped mark on the back. This mark also appears after the first and second moults, but is then of a pinkish cream colour. After the second moult the ground colour of the body usually changes to greenish brown. After the third moult the green colour is much more decided, and the caterpillar assumes more of the shape and markings of the full-fed larva. The thoracic segments are now enlarged and the saddle-shaped mark is almost obliterated. There is a yellowish band in front of segment 2, and another on the hinder edges of segments 5 and 12; that on 5 is followed closely by a black line on the front edge of segment 6. This black line does not show when the caterpillar is at rest. The head is pink brown. On each side of segment 4 now appears a pear-shaped yellow eye-like spot, the larger end outwards. This spot is edged by a fine black line; inside there is a heavy black line enclosing a violet spot.

Towards the smaller end of this yellow spot is a short black bar. The sides of the body are also ornamented with rows of violet spots, two upon segment 4, and four upon 5, 8, 9, 10 and 11, and two upon 12. On segments 6 to 11 there is one small spot below each spiracle. These spots are more distinct upon some specimens than upon others.

After the fourth or last moult the colour is invariably velvety green, paler beneath, the saddle-shaped mark has disappeared and the yellow marks are all more conspicuous. The full-grown caterpillar is shown at figure 10, and is a formidable looking creature. For two days before it suspends itself to change to the chrysalis, it gradually assumes a purplish brown tint, and the violet spots become more distinct than they were before. The full-grown larva is about one inch and a-half in length when walking. When at rest it is shorter and thicker, the head is drawn in out of sight and the body assumes a wedge shape, large in front, tapering rapidly to the last segment. When in this position the yellow spots



Figure 10.

on segment 4 have the appearance of two large open eyes. This appearance may possibly act as a protection from some of its enemies. When ready to turn to a chrysalis, it leaves its food-plant and seeks some place to pupate. It suspends itself to a silken mat and supports its body by means of a silken girdle around the middle. It changes to a chrysalis the second day after suspension. The newly formed chrysalis is very beautiful, being mottled with green, dove colour, black, and white, the two eye-like spots on segment 4 being very distinct. After a few hours, however, the green nearly all fades out and the chrysalis darkens to the tint of dead wood. In all parts of Canada there is only one brood of this butterfly. The eggs are laid in June and July and the caterpillars pupate late in the summer and go through the winter in the chrysalis state. The habits of the caterpillar are sluggish. From the first they spin a mat of silk to rest upon when not eating and sally out to feed. When very young they eat into the edge of the leaf upon which they hatch; but as they grow larger they crawl away to other leaves near at hand, and return again to rest upon the same leaf, all the time there is food at a convenient distance; when this is all consumed they move off to a fresh

branch and start another centre of operations. This mat is so spun as to curl the leaf up somewhat and form a platform, so that in case of rain the caterpillar is raised above the wet leaf. When disturbed they have a special means of defence, in the shape of an orange forked scent-organ, which they can protude at will from an orifice in the second segment. At the same time a strong pungent odour is emitted. The caterpillars possess this organ in all their stages, but seldom use it except in the last stage. The food-plant of this insect is very varied. In this district it is most frequently found upon apple, cherry, ash, birch and aspen trees.

Figure 11 represents a very beautiful suffused melanic male, which



Figure 11.

was taken in July, 1888, by Mr. Robert Mackenzie, at Collins Inlet, upon the Georgian Bay, eighteen miles east of Killarney, Ont. As this is the only approach to a black male which has so far been discovered, it has been thought well to have it photographed and engraved. The specimen is in very fine condition, the black and yellow clear and unfaded. The red eye-spot at the anal angle is distinct, and there is another between the extremities of the second and third median veinlets of the hind wing. A few scales of blue shadow the spot at anal angle. There is a conspicuous cloud of the same colour between the second and third median veinlets and a smaller one between the first and second. At the apex of hind wing there is a light cloud of red scales, and a slight tinge of red between the extremities of costal and first subcostal veins.

THE CLASSIFICATION OF OUR BUTTERFLIES.

BY A. R. GROTE, A. M., BREMEN, GERMANY.

At different times, in making notes for a general list of our Lepidoptera, I have taken up the arrangement of our butterflies, and, although such a list must now be undertaken by some one else, I think it worth while to set down the conclusions to which I had come.

For myself, I have preferred to consider all the true butterflies as more nearly related to each other than to the *Hesperidæ* and *Paleohesperidæ*. In other words, the latter seem the equivalent, structurally speaking, of the other butterflies. The characters by which modern "families" are recognized are unequal, and perhaps these groups are really of no more than sub-family value. But, granting these groups to be as they are now held, families, the sequence, with the *Papilionidæ* at the head, seems less reasonable than that which commences with the *Nymphalidæ*, or the so-called "four-footed" butterflies. And this on general grounds. For it is a clear departure from the usually six-footed type, that the anterior pair should be shortened and rendered more or less useless for walking purposes. It is probably not to be assumed that the families evolved from each other, but evolution was simultaneous and unequal. The character of the shortening of the fore-feet appears in a less degree in other families of butterflies, and probably exists as a tendency latent in the whole group. The fore-feet become gradually disused in walking, and this disuse is followed by a modification of structure. We are tied to a linear series in our catalogues and classifications, and the real descent and sequence in time of our butterflies can never be made out and never displayed in our artificial arrangements. We are conditioned by our own physical structure. Our appreciation of what surrounds us is limited by the imperfection of our senses. We cannot *see* evolution, and the actual progression of growth escapes us. Only by reasoning do we recognize the doctrine of descent. It is easier for us to construct a genealogical tree than to prove its correctness beyond reasonable doubt.

Undoubtedly such drawings assist our comprehension of the possible *modus operandi*, but the artist must be exceedingly well up before he thus gives the reins to his imagination. In the best case they are not facts, and must not be accepted as such; they are, it may be, ladders for the mind, which we may climb if we will, to find at the top perhaps as imaginary

a result as Jack attained from his bean-stalk. To draw such a tree may be pardonable, but to believe in it afterwards, as representing real succession, is an infirmity of the scholar's mind. Who can tell the real succession in time and place? There may be assumed a certain progression in the development of form, but beyond this there is nothing to justify our pretence that we are classifying our Lepidoptera according to real descent. Nature or natural selection deals with individuals; if the type persists, it is represented by species.

It may be that certain species of tropical *Papilio* are more recent evolutions, newer species, than many *Nymphalidæ*; but the four-footed butterfly must have come, one would think, from a six-footed ancestor. Hence, in a linear series, we may commence reasonably with the *Nymphalidæ*. Again, the habits of the larvæ of these latter are very complex, and seem to have been slowly modified and acquired. Mr. Edwards has told us much about them. The larvæ themselves are most curious objects, leaving the usual range of larval forms. In certain genera from South America are curious horns attached to the head, reaching backwards and reminding us of the flower spurs of *Aquilegia*. The larvæ of the *Papilionidæ*, as I have elsewhere said, are not without resemblances to the Hawk moths. As to pupation, it may be assumed that cocoon-making, or spinning, is older than its disuse. Almost all the "higher" groups, that is, groups which may have issued from a former complex, show some modification of this habit in the direction of its disuse. Thus the Hawk moths, which may have come from a common ancestry with the *Ceratocampinæ*, probably first passing through a type analogous to existing *Smerinthinæ*, have very generally discarded cocoon-making. In discussing all these matters, we must be careful not to put the cart before the horse, as the Chippeways did, who held the pretty notion that the butterfly made the south wind, and not the south wind the butterfly.

The *Papilionidæ*, in the consistency and form of the body, in its hairiness, in the dark and bright contrasting colors, in the tailing and structure of the secondaries, show certain approximations to the *Hesperiidæ*, so that our placing them at the end of the true butterflies does not do violence to their structure. And as they are six-legged butterflies, we should naturally finish with them. The departure, which probably exists as a tendency in the group, is here not expressed, and they are like the *Hesperiidæ* in this respect. But we must not look upon the *Papilionidæ*

as a connecting link (*Uebergang*) to the *Hesperidæ*. They are, in most respects, as far from the skippers as any other true butterfly. The coincidences at best indicate that, in certain characters, the *Papilionidæ* stand nearer to the common ancestor than the *Nymphalidæ*. But whether our surmises are right or wrong—and that they are right or wrong cannot be proved, and is a matter of mere reasonable probability—we stand in need of a linear series for our catalogues and collections. This is a practical want, and we must meet it by the most philosophical means possible. We are offered a certain character in the true butterflies, the different modifications of the front pair of feet, and this character it is clearly philosophical and practical to use. We must not be influenced by slighter characters to overturn our conclusions, or by vague general considerations which are wide of the result we are aiming at, which is a *reasonable* sequence for our species, genera and families of butterflies.

I find that Mr. Wallace says that the *Danaidæ*, no less than the *Papilionidæ*, have developed complicated adaptations to the surrounding organic and inorganic universe. Adaptation, mimicry and dimorphism, depend evidently on climate and surroundings, and are not any proof of higher structural value in themselves. They are phenomena called forth by circumstance, with the plastic butterfly as the wax for the seal. Perhaps this very plasticity is a proof of a certain weakness of type, just as weakness of character in us is displayed by our attending to every wind that blows. "In the extensive family of *Nymphalidæ*," says Mr. Wallace, "we find that several of the larger species, of feebler structure, have their wings modified; while the powerful species, which have all an excessively rapid flight, have exactly the same form of wing in Celebes as in the other islands." Size or relative beauty are no guide for a structural arrangement.

I should commence, then, the linear series of our butterflies with the four-footed butterflies: First the *Nymphalidæ*, following these with the *Satyridæ*, which differ by the blistering of the veins of the fore-wings, and are considered by writers generally as a distinct "family." There have to be general considerations guiding our arrangement of the genera; and the knowledge requisite to form these is hardly gathered yet. A mere technical description of form and structure is not of itself sufficient. Comparisons are needed of all the stages. Again, in the stringing together of the mass of detail, the general principles which should guide us in estab-

ishing the higher divisions are lost sight of. The *Satyridæ* are evidently "lower" than the *Nymphalidæ*, perhaps retaining in habits and markings traces of a former physical condition of the globe. I have written briefly, originally, on the habits and conditions of *Oeneis semidea*, and I regard this genus as a low, perhaps the lowest type of Satyrid. We now come to a series of "families" of butterflies in which the shortening of the fore-feet is confined to the male sex. These are the *Libytheidæ*, as I have thought, a very old form of butterfly (Can. Ent. XVIII., 163), the *Erycinidæ*, to which I would refer my genus *Feniseca*, and the *Lycaënidæ*, in which the male fore tibiæ end in a hooklet. We now come to the six-footed butterflies, which we may divide into three "families," the *Pieridæ*, the *Parnassidæ* and the *Papilionidæ*. The *Hesperidæ*, which differ by the proportions of the body and position of the wings, fall into two groups, as the fore tibiæ are with or without epiphysis, and may then follow. The series of butterflies may be closed by my *Palcohesperidæ*, with spinose tibiæ,—moth-like butterflies preparing us for the *Castniadæ*, and apparently relics of a stage between moth and butterfly surviving in the North American fauna.

There is, I think, nothing to be gained by cataloguing our Lepidoptera upside down, as seems to be proposed by Packard, commencing with the supposed "lowest" moths. Theoretically we may conceive that the moths are "lower" than the butterflies, and that in some unknown way the latter have come from moth-like ancestors. Palæontological proof is now wanting, but there is some circumstantial evidence to be gathered that such has been the case. If there has been evolution, then butterfly-like forms cannot have produced moths, but the reverse. At a later epoch in the history of creation than the origin of butterflies, changes of climate have evidently taken place. The winter now finds the butterflies in all stages. The lethargy of the half-grown caterpillar seems to have survived from a time when the winters were longer, came more suddenly, than at present. It was no longer time for the butterfly to grow, or the food plant formerly then perished. Now there is time and food, but the butterfly will not yet believe it, needing the evidence of centuries, and prepares to winter. In the moths I only have observed that certain species remain as caterpillars within the cocoon until spring.

For practical purposes, as well as for the work of comparing the faunæ of North America and Europe, and arriving at some conclusions as

to geographical distribution and origin of the different forms, in which I am much interested, we may arrange the butterflies as here suggested. But whether we assume eight "families" of the true butterflies, or only four, or only one, the sequence and the principle remain unaltered. The characters by which modern "families" are defined, chiefly by German authors *und solche die es werden wollen*, are of unequal morphological value, therefore unnatural and, it seems to me, unphilosophical.

NOTE ON THE LARVA OF THYATIRA PUDENS, GUEN.

BY HARRISON G. DYAR, RHINEBECK, N. Y.

As far as I am aware no description of the larva of this insect has been published, and hence I present the following:—

T. pudens.—Mature larva. Head white, with four black spots, two covering the eyes and the others near the summit of the head. A few short, whitish hairs. Body semitransparent, whitish, flecked with opaque white spots on the dorsum and more thinly on the venter. Stigmatal space covered by a blackish shading, more distinct anteriorly; a darker dorsal line. Spiracles pale brown. Cervical spot whitish, concolorous with body. A few short pale hairs.

The larvæ feed singly on dogwood (*Cornus florida*), each forming a place of concealment by spinning one or more leaves together by the edges. They mature by the middle of June and pupate in a slight cocoon on the ground, the winter being passed in the pupa state. The pupa has its greatest diameter through the wing cases, the abdominal segments tapering. It is dark brown, approaching black, the brown color showing more distinctly between the segments. Body punctured. Thorax, wing and leg cases finely wrinkled. Cremaster, thick, 1 mm. long, furnished with stiff, spiny hooks.

This larva well deserves its name of *pudens*, on account of its modest habits, remaining concealed in its leafy house, and appearing much disturbed if exposed. Its actions recall those of the larva of *Endamus tityrus*.

The insect has only one brood annually.

Larvæ from Dutchess County, N. Y.

PREPARATORY STAGES OF LEPTARCTIA CALIFORNIAE
WALKER, WITH NOTES ON THE GENUS.

BY G. H. FRENCH, CARBONDALE, ILL.

EGG.—Diameter .03 inch. Globular, smooth. Color whitish, with a pearly lustre. Duration of this period here four days, in the mountains of California six days.

YOUNG LARVA.—Length .07 inch. Cylindrical, six rows of tubercles from which spring hairs as long as the body. Color pale gray, head black, hairs gray. Duration of this period four days.

After 1st Moults.—Length .15 inch. Cylindrical, eight rows of tubercles, from which spring tufts of hair. Color dull pale horn yellow, a whitish dorsal line; tubercles black, the hairs gray; head with the top and sides black, clypeus whitish; legs whitish. Before the close of the preceding stage the body was slightly reddish purple. Duration of this period three days.

After 2nd Moults.—Length .25 inch.—Head slightly bilobed; color smoky greenish black; tubercles black, the hairs gray; a dorsal creamy, slightly orange tinted line, and a line of lateral spots of the same color situated between the second and third rows of tubercles, counting from the dorsal line; head pale horn yellow, the upper part black, a small black spot on each side, and a small smoky spot in the centre of the front; feet concolorous with the body. Duration of this period seven days.

After 3rd Moults.—Length .50 inch; shape as before. Color smoky gray, rather dark; dorsal stripe orange, an orange spot each side of the second tubercle on each joint, counting from the dorsal line; tubercles black, each supporting a cluster of spreading brown hairs, those on joints 6 to 11 mostly about the length of the diameter of the body, those on the other joints containing a few that are much longer, the anterior and a few on joint 12 yellow, a long pencil of brown hairs on 13; head dark amber, two blackish patches in front. Duration of this period six days.

After 4th Moults.—Length .60 inch. Color gray, made so by a fine mottling of black and sordid white; the cluster of hairs from each tubercle thick and spreading, the central hairs black, the outer hairs of the cluster gray; the dorsal line, lateral spots and head unchanged.

MATURE LARVA.—Length .70 inch. There was scarcely any change

after the first of this period, As before, the body is cylindrical, with eight rows of tubercles, supporting tufts of spreading hairs, the most of these black with a few gray hairs round the outside of each cluster; the length of the hairs on the middle of body about the diameter of the body, those on the posterior part of the body about twice as long, the pencil from joint 13 about four times as long as those on the back of the middle joints; tubercles still black; head amber, with a prominent blackish spot in the centre of the anterior part of each cheek. Duration of this period 57 days.

CHRYSLIS.—Length .45 inch; length of wing and tongue cases .25 inch, extending almost to posterior part of joint 5; depth of joint 1 .14 inch; of joint 2 .15 inch; of joint 3 .16 inch; from this it tapers slightly to joint 7, from this more abruptly to the end; no hooks at anal extremity; cylindrical, anterior end rounded, the head sloping to the antennæ cases at a little less than 90 degrees; wing and antennæ cases slightly roughened, abdomen slightly punctured. Color, chestnut brown, antennæ cases and outer edges of wing cases a little paler. Duration of this period from 205 to 234 days.

There is but one brood in a season, and unlike most of our insects, it has two periods of what might be called suspended activity. One of these, the pupal period, is common to all insects undergoing complete transformations; the other, just before pupation, an unusual one, unless with a species that hibernates in the larval state. By looking over the different periods, we find them as follows:—

Egg	period....	6 days.
1st larval	"	4 "
2nd "	"	3 "
3rd "	"	7 "
4th "	"	6 "
5th "	" ..	57 "

After the fourth moult the larvæ grew to their full size in a few days, and then remained in a quiescent state, unless disturbed, during the remainder of the period. They passed the last moult July 25th, but did not pupate till September 20th. I could not see that they ate anything during this time of about 50 days, the period of our dry, hot weather, though fresh food was furnished them every day. At first I thought this

might be due to their translation from their home in the Sierras to our warmer climate, and that succeeding broods would behave differently ; but the second brood raised followed the same course as their ancestors.

When preparing to pupate, they constructed loose cocoons of gray silk mingled with hairs from their own bodies, either in folded leaves or next to the dirt in the corners of their breeding box. In this they resemble our Arctians generally.

The eggs from which the larvæ furnishing these notes were obtained were sent me by my friend, Hon. C. F. McGlashan, of Truckee, California. They were received by me July 5, 1885, just hatched, after having been on the road six days. Those I bred the next year hatched in four days. The food plant given me was *Pentstemon*, but I fed them on *Ribes Aur-eum*, or Missouri Currant, which they ate readily ; and I am of the opinion, that like other Arctians, they are rather general feeders.

The only species, besides this, that has a period of summer hibernation in the Bombycidæ, so far as I have noticed, is the larva of *Arachnis Picta*, Pack., described by Mr. Stretch in his Illustrations of Zygaenidæ and Bombycidæ, page 84. This larva was found May 8th and did not pupate till the middle of August, making at least 98 days without food. The *Leptarctia* larvæ remained quiet under the food given them on the earth of the breeding box, unless disturbed, when they would run rapidly, like the species of *Arctia*. I believe Mr. Stretch says the *Arachnis* larvæ emitted a fluid just previous to pupation, similar to that emitted by a moth when coming out of chrysalis. I did not notice whether these did the same or not.

The genus *Leptarctia* was founded by Mr. R. H. Stretch in his book, already referred to, in the time of its publication from 1871 to 1873. At the time of writing the description of the genus he does not seem to have known of Walker's description of *Californiæ*, as he says nothing about it till the close of the work in an addenda. He gives three species, *Lena* and *Decia* by Boisduval, and *Dimidiata* named by himself. Walker described *Californiæ* in 1855 in British Mus. Cat. Lep. Het. Vol. 3, placing it in the genus *Nemeophila*. In 1868 Boisduval described the same form as *Adnata*, together with the two already mentioned, *Lena* and *Decia*, placing them in the genus *Lithosia*, but stating that in his opinion they did not belong in that genus, but in one near *Nemeophila*. Dr.

Packard, in his "Synopsis of the Bombycidae of the United States, 1864", does not mention any of the forms of *Leptarctia*, hence we may presume that he had not seen any of them. In the note already referred to, at the close of the volume, Stretch restores *Californiæ*, and gives *Lena* as a synonym. Grote, in his "New Check List of North American Moths, 1882", gives three names as species, *Decia*, *Lena* and *Dimidiata*, giving *Californiæ* as a synonym of *Lena*. The Brooklyn List, 1881, gives the same three names without *Californiæ*.

This is, as far as I have observed, a synopsis of the history of the forms that have been placed under the genus *Leptarctia* as species. Stretch figured several forms, but grouped them as varieties under the three species he gave. While, for lack of a large series, or the knowledge that could come from breeding, these writers have treated of these forms as species, yet there has been something of a feeling among Lepidopterists for several years that there was really only one species, and all the different forms but varieties, and that such would ultimately be proven.

(To be continued.)

PRELIMINARY CATALOGUE OF THE ARCTIIDÆ OF TEMPERATE NORTH AMERICA, WITH NOTES.

BY JOHN B. SMITH, NEW BRUNSWICK, N. J.

(Continued from page 200.)

As the descriptions are short and so generally unknown, I will reproduce them here:—

"Var. *hybrida*: Primaries of *D. bella*, but the yellow belts indistinct, secondaries of typical *D. ornatix*, but with the ground colour red as in *D. bella*, and with a white edged, interrupted black belt across the discoidal cell.

"Hab.—United States.

"Var. *intermedia*: Primaries with the yellow belts very pale, so that the white borders of the black spots show faintly; secondaries exactly like *speciosa*.

"Hab.—United States."

Genus CALLIMORPHA Latr.

This genus has been so thoroughly discussed by Mr. Lyman and myself in CAN. ENT., XIX, 181-191 and 235-239, that it is scarcely necessary to say anything more here.

The synonymy to the date of my monographic revision in the Proc. U. S. Natl. Mus., 1887, pp. 338-353, is there given with the complete bibliography. Nothing worthy of record has been published since that time, and I therefore add a list of the species for completeness only. As this genus has been monographically treated, I adopt my own order of species:—

<i>C. clymene</i> Brown.	<i>C. contigua</i> Wlk.
<i>interruptomarginata</i> DeB.	<i>reversa</i> Stretch, in part.
<i>comma</i> Wlk.	<i>C. suffusa</i> Smith.
<i>C. colona</i> Hbn.	<i>lecontei</i> ‡ Stretch et auct.
<i>clymene</i> Esp.	<i>reversa</i> Stretch, in part.
<i>carolina</i> Harr.	<i>C. confusa</i> Lyman.
<i>C. lactata</i> Smith.	<i>lecontei</i> ‡ Smith et auct.
♂ <i>conscita</i> Wlk., in part.	<i>reversa</i> Stretch, in part.
<i>C. lecontei</i> Bdv.	<i>C. fulvicosta</i> Clem.
var. <i>militaris</i> Harr.	♂ <i>conscita</i> Wlk., var. <i>b.</i>
<i>confinis</i> Wlk.	<i>C. vestalis</i> Pack.
	♀ <i>conscita</i> Wlk.

Genus EPICALLIA Hbn.

1816—Hübner, Verzeichniss, 182.

Head small, retracted; palpi short; tongue short and weak, about half the length of thorax; ocelli small; antennæ short, simple in the ♂. Legs rather well developed, the middle and hind tibiæ fully spurred; spurs small, those of posterior tibia close together. Claws of tarsi simple.

Primaries with but 11 veins, 8 being wanting; 2, 3 and 4 are from a short stalk out of the end of the median; 5 from the cross vein rather close to the stalk, 6 and the stalk bearing 7, 9 and 10 from the end of the subcostal; 10 therefore *not* from the subcostal. Secondaries with 3, 4 and 5 close together from the end of the median; 6 and 7 together from the end of the subcostal; 8 as usual from the subcostal.

The above description is based upon *E. virginalis*. Mr. Butler thinks the American entomologists have mistaken the type of *Epicallia*.

He says, Ann. Mag., N. H., 1881, ser. 5, v. VIII., p. 310:—"Why Dr. Packard and others have placed this species in *Epicallia*, of which *E. villica* is type, it would indeed be hard to say. Setting aside other differences, the utter dissimilarity of the male antennæ should have been sufficient to keep them widely separated. The pattern and colour of the wings, the less woolly and smaller thorax, and the barred abdomen are all characteristic of *Hypercompa*; in fact, with the exception of the rather shorter costal margin of primaries, which may, perhaps, be regarded as a generic character, I can see nothing to distinguish it from that genus." Mr. Butler claims *dominula* and allies as *Hypercompa* (*Callimorpha* Stgr.), and says our species of *Hypercompa* (*Callimorpha*) differ generically from the European species, and should be referred to *Haploa* Hüb. *Villica*, according to Butler the type of *Epicallia*, is placed in *Arctia* by Staudinger.

Without expressing any opinion on the subject, I refer the matter to some one having the material for study.

E. virginalis Bdv.

1852—Bdv., Lep. Calif. (Ann. Soc. Ent. Fr.), 49, *Chelonia*.

1855—Wlk., C. B. Mus. Lep. Het., III., 611, *Arctia*.

1860—Clem., Proc. Ac. N. Sci., Phil., XII., 529, *Arctia*.

1862—Clem., App. to Morris Syn., 337, *Arctia*.

1864—Pack., Proc. Ent. Soc., Phil., III., 108, *Epicallia*.

1867—Grt. & Rob., Tr. Am. Ent. Soc., I., 333, pl. 6, f. 42, ♂, *Epicallia*.

1873—Stretch,* Zyg. & Bomb., 70, 238, pl. 3, ff. 2, 3, 4, and pl. 10, f. 1 (larva) *Epicallia*.

1874—Pack.,* Rept. Geol. Surv., 1874, p. 559, *Epicallia*.

1875—Edw.,* Proc. Cal. Ac. Sci., V., 186, *Epicallia*,

1876—Stretch, Rept. Surv. West. 100 Mer., V., 802, *Epicallia*.

1881—Butler, Ann. Mag., N. H., Ser. 5, VIII., 310, *Hypercompa* var. *ochracea* Butler.

1881—Butl., Ann. Mag., N. H., Ser. 5, VIII., 310, *Hypercompa* Cites Stretch, Zyg. & Bomb., p. 71, pl. 3, f. 2, as type. var. *guttata* Bdv.

1852—Bdv., Lep. Cal. (Ann. Soc. Ent. Fr.), 48, *Agarista*.

1853—H.-Sch., Lep. Exot., 72, f. 464, *Pleretes*.

1862—Morris, Synopsis, 132, *Alypia*.

- 1864—Pack., Proc. Ent. Soc., Phil., III., 109, pr. var.
 1867—G. & R., Trans. Am. Ent. Soc., I., 334, an sp. dist.
 1869—Bdv., Lep. Cal. (Ann. Soc. Ent., Belg. XII), 74, *Callimorpha*.
 1873—Stretch, Zyg. & Bomb., 70, pr. var.
 1875—Edw., Proc. Cal. Ac. Sci., V., 186, pr. var.
 Habitat—Vanc., Calif., Or., Colo., Ariz.

Genus PLATARCTIA Packard.

1864—Pack., Proc. Ent. Soc., Phil., III., 109.

I have no notes of this genus, never having had a specimen that belonged to me absolutely.

P. borealis Moeschler.

- 1860—Moeschl., Wien. Ent. Monatsch., IV., 360, pl. 9, f. 3, *Arctia*.
 1864—Grt., Proc. Ent. Soc., Phil., III., 74, = *parthenos*.
 1864—Pack., Proc. Ent. Soc., Phil., III., 111, *Platarctia*.
 1867—Pack., Proc. Bost. Soc., N. H., XI., 35, *Platarctia*.
 1869—Beth., CAN. ENT., I., 45, *Platarctia*.
 1873—Strk., Lep. Rhop. et. Het., 24, = *parthenos*.
 1882—Grt., New List, 15, *Platarctia*.
 Habitat—Can., Labr.

Mr. Grote lists this as a distinct species without comment, and I follow his lead. It is the opinion of those with both species, I believe, that *parthenos* and *borealis* refer to varieties of the same form.

P. hyperborea Curtis.

- 1831—Curt., App. to Ross. Narr., 2nd Voy., LXXI., p. 17, *Eyprepia*.
 1855—Wlk., C. B. Mus. Lep. Het., III., 611, *Arctia*.
 1857—Wlk., C. B. Mus. Lep. Het., VII., 1692, *Arctia*.
 1860—Clem., Proc. Ac. N. Sci., Phil., XII., 529, *Arctia*.
 1862—Morris, Synopsis, Supplt., 340, *Arctia*.
 1868—Grt. & Rob. Tr. Am. Ent. Soc., II., 71, *Platarctia*.
 Habitat—Arctic America.

P. parthenos Harris.

- 1850—Harr. in Ag. Lake Sup., 390, pl. VII., f. 4, *Arctia*.
 1855—Wlk., C. B. Mus. Lep. Het., III., 608, *Arctia*.
 1860—Clem., Proc. Ac. N. Sci., Phil., XII., 529, *Arctia*.
 1862—Morris, Synopsis, Supplt., 337, *Arctia*.

- 1863—Saund., Syn. Can. Arct., 4, *Arctia*.
 1864—Pack., Proc. Ent. Soc., Phil., III., 110, *Platarctia*.
 1868—Saund.,* CAN. ENT., I., 5, *Platarctia*.
 1869—Bethune, CAN. ENT., I., 45, *Platarctia*.
 1871—Saund.,* CAN. ENT., III., 225, *Platarctia*.
 1872—Lint.,* Ento. Contr., II., 132, *Platarctia*.
americana ‡ Wlk.
 1855—Wlk., C. B. Mus. Lep. Het., III., 607, *Arctia*.
 1868—Grt. & Rob., Tr. Am. Ent. Soc., II., 71, pr. syn.
 Habitat—Can., Lake Sup., White Mts., Vt., N. Y.

P. yarrowi Stretch.

- 1873—Str., Zyg. and Bomb., 221, pl. IX., f. 7, ♂, *Arctia*.
 1876—Str., Rept. Geog. Surv. West, 100 Mer., V., 800, pl. 40, ff. 1
 and 2, *Arctia*.
 1882—Grt., New List, 15, *Platarctia*.
 1883—Moeschl., Stett. Ent. Zeit., 44, 116, *Arctia*.
 Habitat—Labr., Arizona.

Genus EUPREPIA Ochs.

1810—Ochs., Schmett., III., 298.

Von Heineman's characterization gives for this genus:—Antennæ ♂ and ♀ ciliated, joints with two stouter bristles; anterior tibia with claw at tip. Primaries with accessory cell present. Based upon an examination of *E. caja*, the reference of that species to this genus is an error, since *caja* has the male antennæ pectinated, the fore tibia with but a small spine at tip, primaries without accessory cell. In *caja* the tongue is obsolete, palpi short, head retracted. All the tibiæ shorter than femora; spurs normal, but minute. Claws simple. Primaries with 3, 4 and 5 nearly equidistant from the cross vein or end of median; 6 from cross vein, very little below end of subcostal; 7, 8 and 9 on a long stalk out of end of subcostal; 10 from subcostal before the end of the cell; secondaries with 3, 4 and 5 nearly equidistant from end of median; 6 and 7 together from end of subcostal.

Pudica is said to be the type of the genus!

E. caja Linn.

- 1758—Linn., Syst. Nat. Ed., X., 500, *Bombyx*.
 1767—Linn., Syst. Nat. Ed., XII., 819, *Bombyx*.

- 1781—Fabr., Sp. Ins., II., 198, *Bombyx*.
 1787—Fabr., Mant. Ins., II., 128, *Bombyx*.
 1816—Hübner, Verzeichniss, 181, *Zoota*.
 1852—Bdv., Lep. Cal. (Ann. Soc. Fr.), 49, *Arctia*.
 1855—Wlk., C. B. Mus. Lep. Het., III., 601, *Arctia*.
 1860—Moeschl., Wien. Ent. Monatschr., IV., 360, *Arctia*.
 1864—Grt., Pr. Ent. Soc., Phil., III., 74, an sp. Amer. (?).
 1867—Pack.,* Proc. Bost. Soc., N. H., XI., 33, *Euprepia americana* Harris.
 1841—Harris, Rept. Ins., Mass., 246, *Arctia*.
 1850—Harris in Ag., Lake Sup., 391, pl. 7, f. 5, *Arctia*.
 1855—Wlk., C. B. M., Lep. Het., III., 607, *Arctia*.
 1860—Clem., Proc. Ac. N. Sci., Phil. XII., 529, *Arctia*.
 1862—Clem., App. to Morris Syn., 336, *Arctia*.
 1863—Saund.,* Proc. Ent. Soc., Phil. II., 28, *Arctia*.
 1863—Saund., Syn. Can. Arct., 3, *Arctia*.
 1864—Pack., Proc. Ent. Soc., Phil., III., 114, *Euprepia*.
 1869—Grt., Tr. Am. Ent. Soc., III., 537, an sp. dist., *caja*.
 1872—Lintner,* Ent. Cont., II., 134, *Euprepia*.
 1873—Stretch, Zyg. & Bomb., 95, pl. 4, f. 4, ♀, ib., p. 239 (larva)
 =*caja*.
 1873—Strecker, Lep. Rhop. et. Het., 24, *caja*.
 1875—Edw., Proc. Cal. Soc. Sci., V., 187, *Euprepia*.
 1875—Bunker,* CAN. ENT., VII., 149, *Arctia* (life list).
 1876—Lyman,* CAN. ENT., VIII., 20, *Arctia*.
 1878—Strk., Proc. Dav. Ac. Sci., II., 273, pr. syn.
 1882—Grt., New List, 15, =*caja*.
 var. *utahensis* Edw.
 1886—Edw., Ent. Amer., II., 166, *Euprepia*.
 Habitat—Northern U. S., N. Y., Can., Labr., Alaska, Vanc., Calif.,
 Utah.

I have made no attempt to give the bibliography of the European species. It would have made the references too voluminous, and the European literature is rather easily kept track of.

E. opulenta Hy. Edw.

1881—Edw., Papilio, I., 30, *Euprepia*.

Habitat—Yukon River, Alaska.

Genus CALLARCTIA Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 114.

This genus is unknown to me in nature, unless Mr. Stretch's reference, hereinafter cited, is correct. In that case it needs no special characterization.

C. ornata Pack.

1864—Pack., Proc. Ent. Soc., Phil., III., 115, *Callarctia*.

1882—Stretch, Papilio, II., 147, = *Arctia achaia* !

Habitat—San Mateo, Calif.

Mr. Stretch's note, giving the above synonymical reference, seems to have been carefully made, and the description shows nothing to the contrary. The reference bears all the more weight since Mr. Stretch is not a lumper, and has shown in the past great deference to Dr. Packard's *dicta* in this family. Grote & Robinson's species must, therefore, drop as a synonym, while Dr. Packard's genus must fall. I leave the positive reference to others.

THE ASSOCIATION OF OFFICIAL ECONOMIC
ENTOMOLOGISTS

will hold its first annual meeting in the City of Washington, D. C., on November 12th, 1889, at 11 o'clock, a. m., in the Entomological rooms at the U. S. National Museum.

According to the resolution of the Association at the Toronto meeting, the annual meeting was to be held on the date and at the place where the Association of Agricultural Colleges and Experiment Stations should next meet. The date and place for the latter meeting having been fixed, the above notice is hereby given to all members of the Association of Economic Entomologists. All titles of communications to be read should be sent to the Secretary as soon as possible, and those desiring enrolment as members will also please communicate with the Secretary.

JOHN B. SMITH, Rutger's College, New Brunswick, N. J.

CORRESPONDENCE.

THE FARMER'S OWN INSECTICIDE.

Dear Sir : Take plants of Pokeweed, (*Phytolacca decandra*), roots, stems and leaves : cut them into manageable lengths ; make a decoction—a sap-kettle will be useful for the purpose. Let the liquor cool, and then apply with a sprinkler. This will exterminate the currant-worm, rose-slug and other pests of the garden.

THOMAS W. FYLES.

GNOPHÆLA VERMICULATA, Grote.

Dear Sir : Last year Mr. Bruce published a description of the larva of this insect, giving the food-plant as *Mertensia virginica* (L.) As Prof. J. B. Smith has repeated this record in CAN. ENT. XXI., p. 174, it becomes especially necessary to point out that it is probably erroneous. In the first place, *M. virginica* is not known to occur in Colorado, and the species known from the Platte basin, in that State, are *M. sibirica*, Don., *M. alpina*, Don., and *M. paniculata*, Don.,—the last a new record, being reported from Denver by Miss A. Eastwood. Secondly, the larva of *G. vermiculata* is common in Custer County from 8,000 to 10,000 feet alt., and is found on *Mertensia sibirica*, although I have rarely found it also on *Echinosperrum floribundum*, Lehm. I think, therefore, we may regard *M. sibirica* and *E. floribundum* as the known food-plants of *G. vermiculata*, and throw over *M. virginica* as erroneous, unless Mr. Bruce has anything to say to the contrary. I have elsewhere described the larva and pupa of this insect, and as I have since found the egg, this will be a convenient time to offer a description:—*G. vermiculata* : egg, diam. one mill ; spherical, flattened at base ; pale yellow, smooth, rather shiny. Laid in clusters on leaves of *M. sibirica*. Micawber Mine, Brush Creek, Custer Co., Colo., about 10,000 feet alt., or over. August, 1889. *G. vermiculata* occurs very abundantly in the higher regions of the Arkansas Basin in Colorado, but I have not heard of it on the Pacific slope. It flies lazily by day, visiting especially the flowers of *Senecia* and *Gymnolomia*.

West Cliff, Custer Co., Colo.

T. D. A. COCKERELL.

Mailed November 5th.

The Canadian Entomologist.

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No. 12.

PREPARATORY STAGES OF LEPTARCTIA CALIFORNIÆ WALKER, WITH NOTES ON THE GENUS.

BY G. H. FRENCH, CARBONDALE, ILL.

Continued from page 213.

The first to express this belief and put it in a tangible shape before the public was Mr. A. G. Butler, who published a paper in the Ann. Mag. Nat. Hist., based upon a collection of moths made by Lord Walsingham in Oregon. He states he does not hesitate to say that he believes that the different forms do not represent several distinct species, but different forms or varieties of one extremely variable species. The four names that had been used he retains as names of the four forms they were originally intended to represent, and gives in addition four new names. According to Mr. Butler's idea they would stand as follows :

LEPTARCTIA CALIFORNIÆ.

Var. 1, Stretchii, Butler.

“ 2, Boisduvalii, Butler.

“ 3, Dimidiata, Stretch.

“ 4, Latifasciata, Butler.

“ 5, Fulvofasciata, Butler.

“ 6, Californiæ, Walker (type).

“ 7, Decia, Boisduval.

“ 8, Lena, Boisduval.

He does not describe these in full, but bases his description on the work of Stretch, Ills., Zyg. and Bomb., using the figures on plate 5.

I have before me representations of all but one of Mr. Butler's varieties in my own collection, and those loaned me by my friend, Mr. W. G. Wright, of San Bernardino, California, and three forms that are not referable to any of his. The second variety, *Boisduvalii*, I have not seen : but it is figured by Stretch. From the series I have, I deduce the following brief descriptions, and from them have had made the wood engravings illustrating the different varieties.

LEPTARCTIA CALIFORNIÆ.

Var. 1, *Stretchii*, Butler (Fig. 12). In this the fore-wings are black, with the zig-zag transverse line pinkish white, a spot of same near the posterior angle and a basal dash. Hind wings black, with a few crimson scales in a transverse row beyond the middle. Under side, fore-wings crimson; a black terminal border, broadest at apex; whitish along the costa.



FIG. 12.

Hind wings black, a little red in the outer part of cell.

Two ♂'s from Southern California.

Var. 2, *Boisduvalii*, Butler (Fig. 13). This has the fore-wings black with the transverse band pinkish white, arcuate but not zig-zag, a brief basal dash. Hind wings black with the transverse band, as described by Mr. Stretch, "bright orange red." Described by him from Oregon.



FIG. 13.

Var. 3, *Dimidiata*, Stretch (Fig. 14). Fore-wings black, two whitish spots on the costa and one near posterior angle. In bright examples of this genus three more or less distinct transverse bands may be recognized, usually gray and black with more or less of white blotches in them. The first costal spot here is in band 2 and the other two are in band 3. Hind wings black in my example. Mr. Butler says it



FIG. 14.

may have "a slightly curved series of small ochreous or crimson spots just beyond the middle." Under side, fore-wings black, a broad whitish band from above the cell to posterior angle, and the costal white spot of band 3 repeated. Hind wings slightly flecked with light near the anal angle.

One ♂ from Colorado.

Var. 4, *Albifascia*, French (Fig. 15). This has both wings black with a broad white band across the fore-wings. It is the same as *Boisduvalii*, excepting the crimson band on the hind wings. There is no basal dash or other mark on the fore-wings. Under side, fore-wings black to a little beyond the first third, terminal portion black, attenuated



FIG. 15.

to a point at posterior angle; the rest of wing ochreous white. Hind wings black. Body black, a white line from antennæ back over patagia, sides of anterior and middle femora and sides of anterior tibiæ red, as in the other varieties.

One ♂ from California.

Var. 5, *Occidentalis*, French (Fig. 16). Fore-wings black, a whitish basal dash and three blurred whitish spots in bands 2 and 3. Hind wings black, marked with orange as shown in the figure. Under side, fore-wings orange, a narrow terminal black border, black along the posterior margin, veins narrowly black. Hind wings black with



FIG. 16.

an orange terminal and subterminal band, both united by a broad ray that passes through the cell to outer margin. Stripe on side of abdomen orange.

One ♀ from Northern California.

Var. 6, *Latifasciata*, Butler. (Fig. 17, hind wings with the band *crimson*). Fore-wings black, with three small white spots on bands 2 and 3. Hind wings black, with the median band crimson. My specimen has this band a little more irregular than the figure. Under side, fore-wings with extreme base and terminal third black, the rest crimson, whitish along the edge of the red. Hind wings with the red of the upper surface repeated.



FIG. 17.

One ♂ from Southern California.



FIG. 18.

Var. 7, *Fulvofasciata*, Butler. (Fig. 17, hind wings with the band *yellow*). This is the counterpart of Var. 6, except that the band of the hind wings is pale yellow instead of crimson. My examples show a tendency to a fine pale ray or two from the base of the hind wings towards the yellow bands, while Mr. Wright's specimen does not show this tendency.

Three ♂'s, two from Truckee, Cal., the other from California, but part of State not indicated.

Var. 8, *Californica*, Walker (Typical). (Fig. 18, the light parts of

hind wings *yellow*. Fig. 19 shows the under side). Fore wings black, sprinkled with gray scales so as to give a gray cast to the wing; the three transverse-bands distinct; black, with numerous whitish spots; a basal whitish dash. Hind wings, with the light parts pale yellow. In some the central black band is broken, and in others wanting, only the two black rays and terminal border being present. Under side as in the figure, the yellow pale, and streaked a little at base with red.



FIG. 19.

Ten ♂'s from Truckee, one ♂ from Southern California.

Var. 9, *Wrightii*, French. (Fig. 18, the light parts of hind wings *crimson*. Fig. 19 shows under side). This is like Var. 8, except that the light parts of hind wings are crimson instead of yellow, and the fore wings are less gray tinted. The fore-wings have, instead of numerous white spots in the bands, one at posterior angle and two on costa, with the basal dash. The under surface is shown at fig. 19, and is crimson instead of yellow.



FIG. 20.

One ♂ from Southern California.

Var. 10, *Decia*, Boisduval. (Fig. 20, hind wings *crimson*; under side shown in fig. 21). Fore-wings black, the bands more or less marked by whitish spots; basal dash present. Hind wings crimson, a terminal black border, more or less broken. Under side crimson with terminal black border as in fig. 21, or a few intergrades between this and Var. 9, with a transverse band, as shown in fig. 19.



FIG. 21.

Nine ♂'s and one ♀ with three ♂ intergrades with *Wrightii*, and three ♂ intergrades with *Latifasciata*, all from California.

Var. 11, *Lena*, Boisduval. (Fig. 20, the hind wings *yellow*; the under side shown in fig. 21. Fig. 22 shows an extremely light form). Fore-wings black, tinged with gray; the three transverse bands more or less distinct, both by the clear black without gray, and by the whitish spots. In three specimens from Colorado the bands are almost continuous white,



FIG. 22.

as shown in fig. 22. Hind wings yellow, with a terminal black border ; sometimes much broken, as in fig. 22. Under side in fig. 21, the light part yellow, more or less red stained at base.

One ♂ from Southern California, three ♂'s from Colorado, two ♀'s from Truckee, Cal., and five ♀'s from other parts of California. Besides this there are two ♀ intergrades with *Decia* from Colorado, four ♀ intergrades with *Decia* from Truckee, Cal., and two ♂'s and one ♀ intergrade with *Decia* from Southern California.

One of the principal variations in these forms is found in the amount of black on the hind wings, ranging from wholly black to a few black spots as a terminal border. The first breaking up of the solid black is found in a single light point near anal angle, then a few pale scales across the wing, next a band of light, in the succeeding stage the basal part invaded by pale rays, and finally all the black obliterate except the terminal border. In the specimens having only the terminal border of black, there is a fine penciling of black along the veins, and in the intergrades between *Wrightii* and *Decia* a gradual fading out of both the transverse band and rays may be found till there is nothing but the obliterate penciling of the veins left. Variety 5, *Occidentalis*, seems to be an irregular form that only partially falls within the line of the regular variation. The fore-wings are black in the red forms, with but little if any gray tint ; in the yellow forms, slightly gray tinted, with three more or less distinct transverse bands, which in the gray wings lack the gray tint, and contain in nearly all of them a few white or whitish spots. When only a few spots are present, these are costal in second and third band, and one at posterior angle in third band. Varieties 1, 2 and 4 seem to come from an unusual development of the second band.

The varieties are largely local. The prevailing color of Southern California examples, as seen by the localities under the several varieties, is crimson ; the Sierra Nevada and Colorado forms are mostly yellow, and the Oregon and North California forms are orange. These are the prevailing colors. In the Truckee specimens all my males were yellow and females varying from almost a distinctive orange to yellow, with traces of the red tinge along the veins (of hind wings, of course). In Lord Walsingham's collection from Oregon the prevailing color was orange, and we find that color extending into California. But in each of

these localities there is enough intergrading in color to show the affinity of the different forms.

NOTE.—Varieties 4, 5 and 9 are in the cabinet of Mr. W. G. Wright, of San Bernardino, Cal. I think 4 and 5 were obtained by him from Mr. James Behrens, of San Francisco, and probably both were from Northern California.

THE NOCTUIDÆ OF NORTH AMERICA AND EUROPE COMPARED.

(*Fourth Paper.*)

BY A. R. GROTE, A. M., BREMEN, GERMANY.

Tribe *Arzamini*.

The pale or yellow coloured species of *Gortyna*, the caterpillars being internal feeders, pupating, however, in the ground, prepare us for the *Nonagriini*. We have, however, in North America, a peculiar tribe which I have called *Arzamini*, and which I here interpolate. The caterpillar was first discovered by Prof. Comstock, in Florida Lakes, in the leaf-stalks of the pond lily. This was the larva of *A. vulnifica* var. *melanopyga*, and subsequently in the lake at Ithacá, the larva of the typical *vulnifica* was observed by the same distinguished entomologist. The larva is furnished with nine pairs of spiracles, and passes freely on the water from one leaf to another. Subsequently, the larva of *Sphida obliquata* was described by Prof. Kellicott. The moths of this tribe are related to the Nonagrians, but differ by the bluntly terminating abdomen of the female, recalling certain *Lachneinæ* in appearance. There are two genera: *Arzama*, with three distinct species (of which I owed specimens of *A. diffusa* to my excellent friend Mr. Moffat) in which the front is smooth, and *Sphida*, with the single species *obliquata*, in which the front is tuberculate. This appears not to be a variable or sexual character in the moths, as it may be in certain *Scarabeidæ*, but is in Lederer's opinion, with which I agree, of generic value. If we are not so to consider the tibial armature, or the conformation of the clypeus in the *Noctuidæ*, there remain few characters which we may use as generic. I am disposed to consider, then, *Copimamestra*, which differs from *Mamestra* by the tibial

claw and *Sphida*, which differs from *Arzama* by the clypeal tubercle, as independent genera on the strength of these single characters. The tribe *Arzamini* is not represented in Europe, and, beyond the *Dicopini*, is so far the first distinct structural departure in North America from the European types. While *Dicopis* and allies resemble the *Bombycoidi* or certain *Hadenini* in appearance, the *Arzamini* have a distinct and singular form, and, while their affinities evidently lie with the *Nonagrians*, their peculiar larval structure and habit clearly warrants our considering them as constituting a distinct group or tribe of the *Noctuidæ*. The resemblance in the female abdomen of the *Arzamini* to the Bombycid genus *Eriogaster*, and the unusual larval condition, lends interest to this tribe. May we not consider the *Arzamini* as an American survival of a very ancient form of the *Noctuidæ*?

Tribe *Nonagriini*.

This tribe differs from the *Hadenini* in the absence of body tuftings, and in the finer, smoother vestiture; only in a few genera is there a median thoracic ridge. In these characters *Gortyna* agrees with the *Hadenini*; the habit of the larva probably associates *Euthisanotia*, a tropical genus with foot-hold in Florida, with *Gortyna*. The present tribe is one of the most interesting of the family. The moths are pale or straw-coloured, some with a warmer, a little red or ochre tint, and the larvæ feed in reeds or grass. *Nonagria* has a stout, clypeal projection, and naked eyes; the larva lives in the stems of *Typha* and *Phragmites*, pupating in its burrow. We have eight North American species described; probably many more remain to be discovered, as the moths must be bred, and are not often captured. In Europe, seven are known. So far as known to me, our species are not like the European, or representative. We have an immense species, with the proportions of a small *Sphinx*, from Florida, my *N. permagna*. Our most usual species, perhaps, in the east, of moderate size, is my *subflava*. No species are known to me from California, but we must expect that they await discovery. These *Noctuidæ*, with boring larvæ, inhabiting swamps, must be an old form of the family, once, at least, of very general distribution. The European genus *Coenobia*, with one species, I have not found in North America, but I discovered a Western American genus *Fota*, with two small species, which, from its clypeal

structure and other characters, seems to belong here. I have described one American species of *Senta*, figured in the Buffalo Bulletin (1874); the figures on this plate are in some copies coloured. Of the European genus *Tapinostola*, two North American species are described, one only have I seen. The European genera *Meliana* and *Calamia*, with single species, are apparently wanting in North America; but we have a peculiar genus in *Ommatostola*, with lashed eyes. *Heliophila* Hüb. (= *Leucania* Ochs.) is, perhaps, the leading genus of the group; and, like *Apatela*, *Agrotis*, *Hadena* and *Mamestra*, contains identical and representative species. The eyes are hairy, the thorax smooth, the male antennæ impectinate, the body rather stout, the legs in some species thickly haired. Probably a resemblance of ornamentation between *Pseudolimacodes niveicostatus* and the European *Heliophila conigera*, led Guenée, although the eyes in the former are naked (but Guenée does not study this character), to describe our species, which I am disposed to refer even to a different sub-family, as belonging to *Leucania*. We have probably one identical species of *Heliophila* with Europe: *H. pallens*. Our *H. pseudargyria* seems to be allied to *lithargyria*, while we have a number of species resembling the European *obsoleta*, *straminea*, *comma*, *littoralis*, etc. No species have yet been found in North America at all resembling the European *evidens*, *conigera*, *vitellina*, *turca*. The well-known "Army Worm" *Heliophila unipuncta*, has been taken in England, and in the Madeira Islands, probably introduced from North America. Although single species may have now a wider range, I think we must conclude that the genus *Heliophila*, in North America, belongs to the European element, and is descended from a former common circumpolar fauna. These insects must be collected at light in the neighborhood of swamps and waters by which reeds and flags grow. In the stems of these we may find, in June and July, the grown caterpillars or pupæ of *Nonagria*. The European genera *Mycteroplus*, *Argyrospila*, *Mythimna*, with single or few species, are undescribed in our fauna. It seems probable that our Nonagrians are quite incompletely known, and that in North America, from which twenty-seven species of *Heliophila* are described, while Europe numbers thirty-two, many interesting discoveries await the entomologist in the present group. I have referred here the Californian genus *Zosteropoda*, from the shape of the wings and the tufted legs; and, as in other tribes,

North America is already credited with peculiar genera, with few species, clustering about the two principal genera, which are here : *Nonagria* and *Heliophila*.

Tribe *Scolecampini*.

The body is slender, smoothly haired ; the legs unarmed, thinly scaled, rather long ; the wings vary from rather broad to quite narrow ; the colors are mainly of the preceding group, and the caterpillar of *Scolecocampa* is said to burrow in wood. This tribe, with the *Arzamini*, is exclusively American, and may be considered, equally with that, to be an outgrowth of the Nonagrians. I refer here (see CAN. ENT. XV., 131) the genera *Scolecocampa*, *Eucalyptera*, *Amolita*, *Cilla*, *Doryodes*, *Phiprosopus*. Geyer's figure of *S. liburna* has the primaries shaded with red, a feature I have noticed in fresh Southern examples of the moth. Mr. Morrison seems to have had no notion of the affinities of his *Eucalyptera bipuncta* ; I referred the moth to *Scolecocampa*, the differences seeming only comparative, or of specific value. Since then I found a second Western form, and, although the differences are not very decided, I adopt the genus. In this tribe the ornamentation seems a modification of the usual Heliophilid type. The longitudinal medium stripe, the pale oblique shade to the still pointed primaries, the dots and dotted stigmata, varying in expression in the different genera, are Heliophilid features ; while the oblique and longer palpi, often smoky on the sides, the slender feet and linean body distinguish the tribe. *Doryodes* is described as a Geometrid by Guenée, and *Phiprosopus* (printed *Phyprosopus*, originally in error) is described, under characteristics which do not belong to the genus and were accidental in the type, equally as a Geometrid by Zeller, who subsequently acknowledged my prior and more correct reference of *P. callitrichoides* to the *Noctuidæ*. The chiloform appearance of most of the genera becomes almost lost in *Phiprosopus*, notwithstanding the narrow wings, while the labial palpi depart from the usual form ; these latter, and the peculiar color, remind one of certain exotic genera allied to *Calpe*, where I was at first disposed to locate the genus. When the immature stages are known, our present views may be modified. Always must our classifications be judged by their reasonableness in reference to the existing knowledge of the whole history of the insects.

Tribe *Caradrini*.

In this tribe, in which the body is still smoothly scaled, or with very slight tufts, the eyes naked, the tibiæ unarmed, the two principal European genera are represented in North America. In *Caradrina*, twenty-eight European species are described, while but eleven have so far been discovered in North America. Of these, *Miranda* seems to be exceedingly near the rare and local European *lepigone*, while others have the European facies. The species of *Pyrophila* (= *Amphipyra*) are interesting as affording one identical species, *tragopogonis*, and one representative, *pyramidoides*. Whether the former is a survival or an importation is uncertain, I have been inclined to believe the latter is the case. The species of *Pyrophila* are large and so exceedingly like the flat species of *Agrotis*, that (when in the south away from my microscope) I mistook *tragopogonis*, communicated to me by Prof. Saunders as injurious to grape, for an *Agrotis*. The unarmed legs separate the present genus; but the habit is similar, as I have observed *pyramidoides* beneath the bark of decaying trees in the woods. Upon the loose bark being removed the moths endeavored to escape by running. Like cockroaches, the smooth greasy-looking vestiture, and the flat shape, evidently facilitate their movements in such places of concealment; I have observed species of *Agrotis saucia*, etc., in their company. The question of whether we should not bring in the *Agrotini*, between the *Caradrini* and the *Orthosini*, is yet, perhaps, an open one. No reasons are given by Lederer for not following the arrangement of older authors; but it is better to conform in such cases to Lederer's example, as it is followed in Europe, and since my main object has been always to bring the two faunæ under the same artificial system, so that they can be compared, the differences and resemblances taken note of. In the present tribe the derivation of one part of our fauna is very clear. The European *pyramided*, and our *pyramidoides*, are descended from one stock. We have apparently failed to take over the other large and showy species of *Pyrophila* found in Europe, as I have seen nothing like them in any North American collection. In the west is found my *Fotella notalis*, a moth apparently allied to *Acosmetia*; this latter, with the other European Caradrinid genera, I have not recognized in North America. I am uncertain as to whether *Adipsophanes* and *Crambodes* should not be included in this tribe; the former genus includes my *miscellus* and *terminellus*, the latter Guenée's *talidiformis*.

THE NORTH AMERICAN CALLIMORPHAS.

A REPLY TO CRITICS.

BY H. H. LYMAN, MONTREAL.

Since my article on the North American *Callimorphas* appeared in the CANADIAN ENTOMOLOGIST for October, 1887, a number of papers upon the same subject, and containing certain criticisms of my views, appeared in subsequent numbers of this magazine, and in Entomologica Americana; and, in addition, I received certain letters upon the same subject from entomologists to whom I had sent copies of my article. To these critics I now propose to make a perhaps rather tardy reply:—

Mr. J. B. Smith had spoken before the Entomological Club of the A. A. S. upon this subject, and the discussion had been reported in Entomologica Americana, but, as Mr. Smith surmised, I had not seen the report till after my paper was in the hands of the printer; and, although Mr. Smith's paper in the Proceedings of the National Museum appeared before mine, I did not hear of its issue till after the publication of my own. In the CANADIAN ENTOMOLOGIST for December, 1887, appeared Mr. Smith's review of my paper, in which he admitted the correctness of my determination of the true *Lecontei* of Boisduval, and of many of my contentions, though expressing his dissent from others, especially in the matter of nomenclature. There was, however, one typographical error of some importance in that paper, on page 236, line 27, where the figures 6 and 8 should have been 4 and 6. In that paper, Mr. Smith arranged the species of this genus in a slightly different order from that adopted by me, by changing the order of the two forms *Confusa* and *Suffusa*.

This is a small matter, and one about which I am not disposed to quarrel, especially as it seems to me that no linear arrangement of species can ever be quite satisfactory, as to correctly express the full relationship of species, we should require to group them in all three dimensions of space. But the chief issues between us were whether *Vestalis* should be regarded as a distinct species, or only a synonym of *Fulvicosta*, and as to the correct application of the names *Conscita*, *Lactata*, *Confusa*, *Suffusa* and *Reversa*.

In regard to the first point, Mr. Smith conjectured that I had never seen a true *Vestalis*, and he very kindly sent me a specimen as typical of that form. This specimen is certainly very remarkable, as it is much

smaller than any specimen of *Fulvicosta* that I ever saw, measuring only $38\frac{1}{2}$ mm. in expanse, and is, as Mr. Smith says, "whiter and more frail and *Euchaetes* like," though it has none of the semi-diaphanous appearance of *E. Collaris*. It is, of course, impossible to form a safe judgment upon a single specimen, and I can only say, that if a full series should show constant differences from *Fulvicosta*, and no connecting links be found, I should be inclined to concede the distinctness of this form.

This is one of those cases where it is much easier to see a difference than to describe it. Dr. Packard, however, who described *Vestalis*, wrote to me that he now considered his types to be only small specimens of *Fulvicosta*.

Mr. Smith advanced the opinion that this was the form given by Walker as *Conscita* ♀ instead of *Fulvicosta* as generally supposed; but as I regarded this as extremely improbable, I took a life-size photograph of my specimen and sent it to Mr. A. G. Butler, who wrote: "The small form is unknown to me, though I have seen an example of *Euchaetes collaris*, under the name of *vestalis*." Mr. Smith also disagreed with me in regard to my citing his name *Lactata* as a synonym of *Conscita* Walk., and argued that *Conscita* ♂ = *Lactata* Smith, *Conscita* ♂ var. b. = *Fulvicosta* Clem. and *Conscita* ♀ = *Vestalis*, and argued that such confusion should militate against Walker's name being retained.

Mr. Walker's errors were no doubt great, especially his placing *Conscita* in a wrong genus; but from what Mr. Butler wrote in reference to the small *Vestalis*, I do not believe that Walker had that form before him at all. His only mistake, after the generic one, was in taking *Fulvicosta*, which had already been described by Clemens, to be the ♀ of *Conscita*, and this, apart from the creation of a partial synonym, was not so very dreadful, seeing that such a relationship would only imply a sexual variation similar to that between the ♂ and ♀ of *Leucarctia Acrea*. I, therefore, maintain my position as to the validity of Walker's name for this form, whether it be a species or only a variety, and in this I am supported by Mr. Butler, who wrote to me as follows: "There can be no question that if *conscita* is a good species (which I do not believe it to be), the first and larger part of Walker's description applies to it, and the mere fact of his referring the wrong female to it will not invalidate that description any more than if Walker had described the male only. Smith's name has not a leg to stand on." Mr. Smith further urged that I was not consistent, and that if his name *Lactata* fell before *Conscita* Walk., my name *Confusa* would

have to give way to *Reversa* Stretch, and added, "I scarcely expect Mr. Lyman's adhesion to this theory." Probably not, but certainly not from the idea which he would seem to imply, as I trust I am not so petty as to allow any desire to have my own name stand, to warp my judgment as to what would be right in the premises.

Mr. Smith claimed that Mr. Stretch's name *Reversa* included *Confusa* as well as *Suffusa* and *Contigua*. I doubt this very much, but let it be assumed that it did, what follows? This is Mr. Smith's reasoning; *Contigua* had priority for one part of Stretch's description, "I separated *suffusa*, and the name stands for the remaining part, viz., *confusa* Lyman, which would remain only as a synonym of *reversa*." This I consider, and I trust Mr. Smith will forgive me for saying it, absolute nonsense, though unlike Mr. Smith's friend at the New York meeting, without any profane adjective.

What Mr. Smith did subsequently to Mr. Stretch's description could hardly affect the application of that name unless he had pointed out that the name *Reversa* covered several distinct species, and proposed that it should be limited to one of them, and then proceeded to give a new name to any other undescribed form.

Mr. Smith did not do this, and naturally so, as he thought, the name *Reversa* included *Contigua*, *Lecontei*, and the form which he undertook to describe as *Suffusa*. He thus proceeded to give a new name to what he considered the only previously undescribed species included by Mr. Stretch in his description. Certainly the greater part of the description of *Reversa* applies to *Suffusa*; Mr. Stretch, especially, saying that the markings "are exactly as in *Clymene*," and Mr. Smith, himself, acknowledged this to me. I, therefore, think that if the name *Reversa* is to stand, it must be for *Suffusa*, and not for the form which may possibly have been referred to in the following bracketed eight words of a sixteen line description: "The basal patch is triangular, (sometimes divided by a narrow, basal brown brand)."

I think, however, that as the first half of the description was evidently intended to cover *Contigua*, which Mr. Stretch appears to have considered the stem form, the name should be ignored, except as a synonym, and Mr. Butler wrote that he agreed with me on this point. Mr. Grote, on the contrary, wrote that *Reversa* should stand with *Suffusa* as a synonym.

Mr. Butler found fault with both Mr. Smith and me for using the

name *Callimorpha* for these moths, writing as follows:—"I have strongly objected to the use of this generic name for this group on the following grounds, viz.:—1. The type of *Callimorpha* is *C. jacobææ*, a European *Lithosiid*. 2. There is already a generic name—*Haploa* Hübn.—for the North American representatives of *Hypercompa*. I have pointed out to Smith that there are structural differences between *Hypercompa* and *Haploa*, and although these characters are slight in themselves, I am of the opinion that, taken in conjunction with the utterly different aspect and style of coloration of the species, they should be regarded as sufficient."

Mr. Smith, it will be remembered, in his paper in the Proc. Nat. Museum, '87, 23, held that these "structural differences" were too slight to warrant such a separation, and affirmed, besides, that they were not constant, and for myself I may say, as I wrote to Mr. Butler, that I am not in a position to decide the question satisfactorily, even to myself, and so prefer to leave it to the authorities.

Mr. Grote, in two short communications to the CANADIAN ENTOMOLOGIST, while complimenting me on my plate and on my sorting out of the moths, insisted that my work was not original, and that these forms could not be regarded as distinct until they have been proved so by breeding from the egg.

I am not greatly concerned as to whether my humble work in this department is "original" or not. I contend that it is at least useful, but if the description of a form as a new species is not original, what is to be said of Mr. Grote's own work in the same direction? As to the argument about breeding from the egg, which has also been urged in letters by others, I repudiate it as unscientific and impracticable. If no one was to be permitted to describe a species as new until he had proved it to be such by breeding from the egg, there would long ago have been a complete block in the study of North American entomology, and there would not have been so many specific designations followed by the honoured name of Mr. Grote. Besides, it is not such a long time since a very distinguished entomologist described as a new species a form which he had "established on a sure foundation by breeding from the egg," and which shortly afterwards turned out, upon further breeding, to be only a previously named form of a well known polymorphic species. It is, therefore, difficult to say how much breeding would have to be done before these doubting Thomases could be convinced. I may say, however, that

I held back my paper for several years in the hope of being able to breed the two forms, *Lecontei* and *Confusa*, side by side, but the appearance of such a muddle as the description of *Reversa* Stretch decided me to publish the results of my studies, so far as they had gone, with as little delay as possible.

Dr. Packard wrote that he could not believe in the distinctness of these species, and that Mr. Otto Seifert had bred a good many forms and considered them varieties of *Lecontei*. I immediately wrote to Mr. Seifert to ask for particulars of this most important information, and received an answer in which he said:—"Dr. Packard must have misunderstood me in saying I reared those *Callimorphas*. Showing the doctor quite a number of this insect in great variety I told him they had been caught (by Mr. Putnam Cramer) near Troy, N. Y., in July, all at the same spot." Finally, Dr. Lintner wrote very guardedly that *C. contigua* at least seemed distinct.

It would thus seem that these unfortunate moths, having got the reputation of all belonging to one species, it is impossible to get people to accept the idea that they may really be distinct species, although they are quite ready to accept as such any apparently new form of such difficult genera as *Colias*, *Argynnis* or *Catocala*, even when the difference is so slight as to be hardly perceptible.

I consider the *Callimorphas* far more distinct and more easily separated than the species of very many genera of butterflies and moths which could be named in addition to those referred to above. I have seen in all at least two hundred specimens, and until very recently and since the publication of my paper, I had never seen one that I could not unhesitatingly place at sight. The exception was in the case of a few specimens in the collection of Dr. Bethune, which seemed to indicate a possible linking of the two forms, *Confusa* and *Suffusa*, and I am prepared to admit that possibly these two forms may turn out to be northern and southern varieties of one species, though Mr. Smith disagrees with me strongly on this point.

I hold, however, very strongly with Mr. W. H. Edwards that whenever a form is distinctly and easily separable from previously named species, it is entitled to be treated as a good species, and to be given a specific name until it is proved to be only a variety by breeding, and that in such a case the name should be retained as a varietal name; but with regard to this breeding from the egg, I would point out that the making of these

experiments is just as incumbent upon those who deny as upon those who assert the validity of these specific distinctions.

For myself, I care very little whether entomologists acknowledge that these moths belong to distinct species or not, if they will only regard them as distinct forms or varieties. No good can possibly come from lumping such forms as *Lecontei*, *Contigua*, *Confusa*, *Suffusa* and *Fulvicosta* under one name. Let these names be used if only as varietal names, in order that we may know what writers on the subject refer to, and learn something of the distribution of these interesting forms. If this is done, and those who have the opportunity and time will breed them and publish the results of their experiments, I shall be quite content, and shall have no fear of the correctness of my views being disproved, but even if the results should controvert my belief, I shall be quite satisfied so long as the truth is established.

NOTE ON THE PREDATORY HABITS OF CHÆTOPSIS ÆNEA (WIED).

REV. THOMAS W. FYLES, SOUTH QUEBEC.

In the beginning of July last I discovered in a bed of *Typha latifolia*, in the neighborhood of Montreal, a large number of the larvæ of *Arzama obliquata*. I have visited the spot repeatedly, and have had the larvæ under daily observation. One remarkable circumstance concerning them is that they are liable to attacks from the maggots of a fly belonging to the Ortaliidæ, viz. :—The *Chatopsis ænea* of Wiedeman, the *Ortalis trifasciata* of Say. I found that larvæ, in the proportion of about one in every six, had been overcome by these maggots. Some of the victims were quite dead ; some were still writhing. As many as twenty maggots were feeding on one caterpillar, draining away its juices. They were of the usual form, pointed at one end and truncated at the other. When mature, their length was about seven-sixteenths of an inch. I raised a great number of them, feeding them upon injured *obliquata* larvæ. The pupal stage lasted about ten days ; and all through August the flies continued to make their appearance. They are very beautiful. The head is white ; the eyes are dark brown ; the body is green and glossy ; and the legs, antennæ and mouth-organs are brownish yellow. The wings are whitish and hyaline ; they have black tips and two transverse black bars, the hinder of which touches the black tips at the costal edge. I am indebted to Dr. Hagen for the identification of the species.

PREPARATORY STAGES OF PYRAMEIS CARYE, HÜBNER.

BY HARRISON G. DYAR.

The eggs are deposited by the butterflies, singly, on the upper surface of the leaves of the food-plant, the *Malva*. They are nearly cylindrical, but thicker in the middle, the base and top quite flat, and rather abruptly rounded. The longitudinal ribs project beyond the summit; color green, of a slightly bluer tint than the leaves. Length 7 mm.

FIRST LARVAL STAGE.—Head, cervical spot, anal plates, and alternating row of eight black dots per segment and short hairs, all black. Body dark yellowish. Head without processes, smooth and shiny. The caterpillar spins a web on the surface of the leaf, beneath which it lives and eats the upper portions of the leaf. Length about 2 mm.

SECOND LARVAL STAGE.—Head black and hairy. Body pale purplish black; short spines bearing black hairs, arranged as in the mature larva, black, but the dorsal and sub-dorsal on joints six, eight and ten, yellow. Length 4 mm.

THIRD LARVAL STAGE.—As in the preceding stage, but the sides faintly mottled with yellow, and a geminate yellow dorsal stripe. Length 8 mm.

FOURTH LARVAL STAGE.—Head slightly cordate, bronzy black, with minute, yellow speckles and black hairs. Body purplish black, with small yellow spots, a geminate dorsal yellow line, irregular and interrupted, and a series of irregular supra-stigmatal and sub-stigmatal spots. Spines black. Length about 15 mm.

FIFTH LARVAL STAGE.—Mature larva. Quite variable in appearance, but the markings are essentially the same. Head black, covered with many white hairs, and on the vertex about six orange elevated spots bearing black hairs. Body dull greenish and black mottled, varying in intensity of shade from black, through gray, to a dull dirty white, but usually light colored, thus distinguished from its ally, *Pyrameis cardui*. On the body are many orange or yellow spots, appearing to be irregularly placed, but they may be arranged as follows:—A row in sub-dorsal space, three contiguous lateral rows (in one example in which the spots were yellow, the central lateral row was orange), and a supra-stigmatal and sub-stigmatal row, all irregular. Spines black or white, or, in some, the anterior ones black, branched, and each tipped by a black hair. The spines are seven per segment on joints five to twelve (*i. e.*, dorsal, sub-dorsal, lateral and sub-stigmatal), none on joint two, four on joints three

and four, and two on joint thirteen. The body is covered by many small elevated spots producing short white hairs. Venter greenish, mottled with black or brown. Length about 30 mm.

CHRYSLIS suspended by the cremaster, depressed behind the thorax, the thoracic process short and pointed, tapering anteriorly in a ridge, wing cases prominent, abdominal segments small and quickly rounded, cremaster flattened and hooked to the button of white silk, a pointed elevation at each eye, and at the base of the wing cases. Three rows of dorsal pointed elevations on the abdominal segments with two points on the thorax, touched with white, and two large and two small white spots in the depression behind the thorax. Color of chrysalis wood brown, minutely mottled with whitish or darker to black. The caterpillar forms itself a hollow in which it lives, by spinning up one or more leaves of the food-plant. The length of each stage is about four days, and the pupa state lasts about two weeks. In its early stages the insect cannot be distinguished from *Pyrameis cardui*.

Larvæ from Los Angeles Co., California.

BUTTERFLIES AT QU'APPELLE, ASSA.

BY HENRY SKINNER, M. D., PHILADELPHIA.

The following is a list of butterflies caught near Fort Qu'Appelle, Northwest Terr., by Mrs. Cora E. Rose and her two little sons. Mrs. Rose describes the locality as follows:—"Those sent were all caught within a radius of about half a mile, in the territory of Assiniboia, thirty miles north of an old Hudson Bay Post called Fort Qu'Appelle, and distant west from Winnipeg some three hundred and twenty-five miles; the only foliage is willow and poplar."

Papilo rutulus, Bdl.

Pieris protodice, Bdl.

Colias christina, Edws. A number of males and one female, the orange form.

Colias philodice, Godt.

Colias Scudderii, Reak.

Colias eurytheme, Bdl. A number of fine males and one female.

Lycena Scudderii, Edws. Male and female.

Chrysophanus helloides, Bdl. Male and female.

Chrysophanus florus, Edws. Male and female.

Danaïs plexippus, Linn. One very peculiar looking male expanding only three and one-half inches and having the primaries produced apically in a remarkable manner.

Euptoieta claudia, Cram. This has previously been reported from N. W. Terr. by Geddes; all the books give it a much more southern range, Strecker giving it from Pennsylvania southward and Edwards's northernmost points being Quebec and California.

Argynnis lais, Edws.

Argynnis bellona, Fabr.

Melitea carlota, Reak.

Grapta progne, Cram.

Vanessa milberti, Godt.

Vanessa antiopa, Linn. The expanse is considerably less than in those found here (Phila.)

Pyrameis cardui, Linn.

Pyrameis huntera, Fabr.

Limenitis arthemis, Drury.

Erebia discoidalis, Kirby.

Erebia sine-ocellata, Nov. var.

This is a var. of *epipsodea*, Butler, which, I think, deserves characterization. It has the bright fulvous patch on the superior wings divided into four sections by the sub-costal and discoidal nervules. Above the third median nervure is a small fulvous patch separated from the rest. There are but two black dots on the fulvous, and the white dots, which in *epipsodea* make them ocelli, are wanting. The underside of the superior wings is practically the same as the upper. Described from two specimens, one from Fort Qu'Appelle and the other in the Coll. Am. Ent. Soc., locality unknown. The Fort Qu'Appelle specimen is very much darker than *epipsodea* usually is. *Epipsodea* is quite a variable species, individuals differing in the size, colour and number of the ocelli, also in the extent and number of the fulvous patches. One marked specimen having four white pupilled ocelli.

Chionobas varuna, Edws.

Satyrus, var. *boopis*, Behr.

Satyrus, form *olympus*, Edws. Three specimens. They do not agree entirely with *olympus*, but I did not think they deserved a new name.

Cænonympha typhon, Rott. If this is not a variety of the European form it is most likely a new species. Two examples only.

Pamphila Manitoba, Scud.

Pamphila cernes, Bdl.-Lec.

Thymelicus garita, Reak.

Nisoniades icelus, Lint.

CORRESPONDENCE.

A RARE MOTH.

Dear Sir: Allow me to record the capture, in Canada, of the rare moth *Thysania (Erebus) Zenobia*, Cramer.

On the evening of Aug. 20th, 1888, while sugaring for Catocala in the woods near this village, I came upon the strange visitor. He was sitting, with wings spread, sipping my bait, and was evidently more at ease than I. The sensation which a hunter is said to experience on sighting his first deer came upon me, for I was unprepared for such an encounter. However, the monster was taken.

By a careful comparison of my specimen with the descriptions and with Drury's figure of *T. Zenobia*, and by submitting it to three different Entomologists of eminence, all of whom concur in my opinion, I have placed its identity beyond a doubt.

The only reference, as far as I can find, heretofore published of its occurrence in North America is in the following foot-note in Prof. Grote's Check List of Noctuidæ North of Mexico, P. II., page 43 (1876), viz.:—"Professor Riley informs me that this species occurred at Davenport."

In Vol. XVIII., page 236, of this Journal, Prof. Grote mentions *Thysania Zenobia* as one of the "species which are probably summer birds of passage from the West Indies and South America, following the Gulf Stream, or aided by prevailing winds."

Drury gives Jamaica as its habitat.

It is hard to believe that so frail a creature as an insect, though strong in flight, could have flown two thousand miles, but the ragged condition of the margins of the primaries in my insect, while all the other parts are apparently quite fresh, is evidence of its having fanned many miles of atmosphere.

A. H. KILMAN, Ridgeway, Ont.

Mailed December 7th.

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- ERRATA.—Page 159, line 4 from bottom, for "*Amphixepa*" read "*Ampiscepa*."
" 161, line 21 from bottom, for "Arizona" read "Arizone."
" 162, " 7 from top, for "in" read "is."
" 162, " 11 " " " "boat-shaped" read "boot-shaped."
" 162 and 163, for "Genura" read "Geneura" wherever it occurs.
" 178, line 3 from top, for "*Hucita*" read "*Helcita*."
" 182, line 14 from top, for "Mr. Percy Crawford" read "Mr. Frazer S. Crawford."
" 182, line 26 from top, for "Colonel Robins" read "Colonel Dobbins."
" 209, line 4 from bottom, for "Endamus" read "Eudamus."
" 220, line 3 from top, for "*Phytolacca decandra*" read "*Veratrum viride*."

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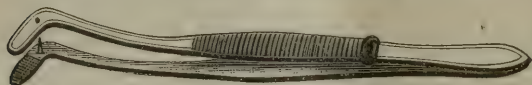
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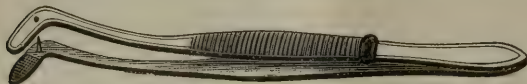
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VOLUME XXI



EDITED BY

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PORT HOPE, ONTARIO.

JULY, - 1889.

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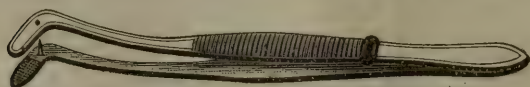
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VOLUME XXI



EDITED BY

REV. C. J. S. BETHUNE.

PORT HOPE, ONTARIO.

OCTOBER - 1889

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